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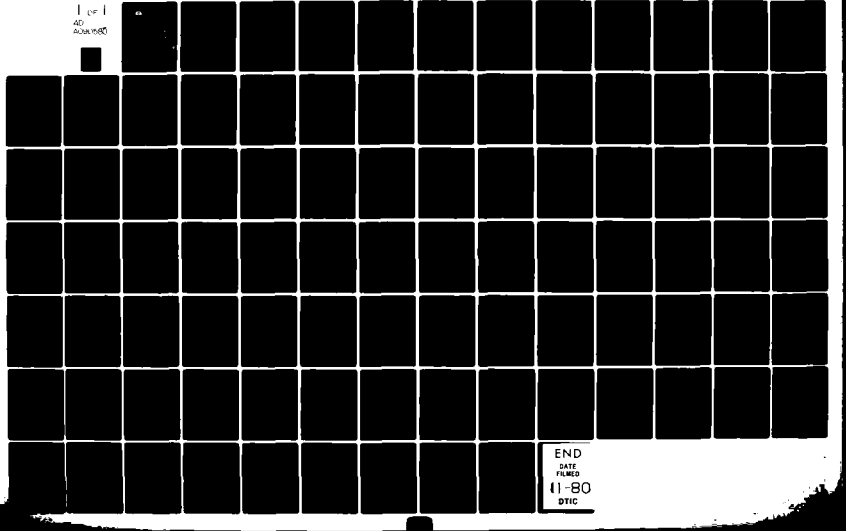

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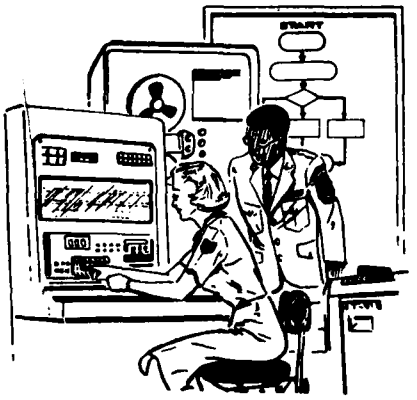
OCCUPATIONAL SURVEY REPORT



III. PROGRAMMING SPECIALTY

AFS 511X1.

AFPT 90-511-413

VOLUME III OF III

MAY 1980

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OCCUPATIONAL ANALYSIS PROGRAM
USAF OCCUPATIONAL MEASUREMENT CENTER
AIR TRAINING COMMAND
RANDOLPH AFB, TEXAS 78148

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PREFACE

This report presents the results of a detailed Air Force Occupational Survey of the Programming specialty (AFSC 511X1). The project was directed by USAF Program Technical Training, Volume 2, dated October 1978. Authority for conducting occupational surveys is contained in AFR 35-2. Computer printouts from which this report was produced are available for use by operating and training officials.

The United States Air Force occupational analysis program originated in 1956 when initial research was undertaken by the Air Force Human Resources Laboratory to develop the methodology for conducting occupational surveys. In 1967, Air Training Command (ATC) established an operational analysis program which initially produced 12 enlisted career ladder surveys annually. The program was expanded in 1972 to produce surveys of 51 career ladders each year and again in 1976 to include the survey of officer utilization fields, to permit special applications projects, and to support interservice or joint service occupational analyses.

The survey instrument used in the present project was developed by Mr. Robert Alton, Inventory Development Specialist. First Lieutenant Linda Wiekhorst analyzed the survey data and wrote the final report. This report has been reviewed and approved by Lieutenant Colonel Jimmy L. Mitchell, Chief, Airman Career Ladders Analysis Section, Occupational Survey Branch, USAF Occupational Measurement Center, Randolph AFB, Texas 78148.

Computer programs for analyzing the occupational data were designed by Dr. Raymond E. Christal, Manpower and Personnel Division, Air Force Human Resources Laboratory (AFHRL), and were written by the Computer Programming Branch, Technical Services Division, AFHRL.

Copies of this report are available to air staff sections, major commands, and other interested training and management personnel upon request to the USAF Occupational Measurement Center, attention to the Chief, Occupational Survey Branch (OMY), Randolph AFB, Texas 78148.

This report has been reviewed and is approved.

BILLY C. McMASTER, Col, USAF
Commander
USAF Occupational Measurement Center

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SUMMARY OF RESULTS

1. Survey Coverage: Inventory booklets were administered to both Computer Operators (AFS 511X0) and Programmers (AFS 511X1) worldwide during the fall of 1979. The 511X1 survey results are based on the responses from 914 of the 1,587 assigned personnel or 58 percent of the total assigned population of Programmers. A majority of the respondents were assigned to AFCC, SAC, TAC, AFSC, and ATC.

2. Job Structure: One major cluster and six independent job types were identified as being relevant to the 511X1 specialty. The overall homogeneity of the specialty is reflected in the Computer Programmer Personnel cluster (composed of ten job types) which includes 72 percent of all 511X1 respondents. Independent job types which directly related to programming were Data Base Administrators, Systems Analysis and Design Personnel, and Training Personnel; each concentrating on unique programming-orientated functions. Overlap with the 511X0 specialty was apparent in the discussion of two additional independent job types, Computer Systems Monitors, and ADP Systems Acquisition Personnel.

3. DAFSC and AFMS Analyses: A common core of tasks are performed by all skill level personnel. As skill level increases, the diversity of possible job functions increases. Three-skill level personnel are found primarily in programming job groups, 5-skill level incumbents branch out into Computer Systems Monitoring (CSM) and Data Base Administration, while 7-skill levels may be found in Training, ADP Systems Acquisition, and Systems Analysis and Design. The normal transition from a technically orientated job to one of supervisory responsibility is not apparent in the DAFSC analysis. When looking at AFMS groups (four-year enlistment periods), supervisory functions are not extensively performed until the 12-16 year point. However, even at the 20-year point, technically related programming tasks are still dominant.

4. AFR 39-1 Evaluation: The skill level descriptions were accurate and portrayed the major functions being performed by survey respondents. Recommendations were made clarifying terminology and restructuring paragraphs to provide a clearer picture of programmer responsibilities. An additional paragraph was developed to include the operations-related tasks performed by programmers.

5. Analysis of CONUS Versus Overseas Groups: When comparing 5-skill level Programmers stationed overseas and CONUS, very few differences were apparent. Many types of unique organizations are only located in the U.S. causing some differences to occur. While the COBOL programming language is used worldwide, CONUS respondents did tend to indicate using several additional computer languages.

6. Training Analysis: Computer systems tasks rated the most difficult were related to troubleshooting and were not performed by substantial (30 percent or more) percentages of the programmer personnel. Those tasks rated above average in difficulty and performed by 30 percent or more of the 511X1 respondents however, were orientated to programming. When looked at in training emphasis order, programming tasks were ranked highest and were performed by substantial percentages of first enlistment personnel.

7. Implications: Overall, the data analyses of the Programming Specialty revealed a very homogeneous job function. The occurrence of programmers performing operations-related tasks suggests an overlap with functions performed by personnel in the Computer Operator specialty. The survey data supports the recent classification changes to the entire Computer Systems career field, with the job structure remaining fairly stable since the last Occupational Survey Report.

OCCUPATIONAL SURVEY REPORT
PROGRAMMING SPECIALTY
(AFSC 511X1)

I. INTRODUCTION

This is a report of an occupational survey of the Programming (AFSC 511X1) specialty, completed by the Occupational Survey Branch, USAF Occupational Measurement Center, in May 1980.

This occupational survey was initiated at the request of the Interservice Training Review Organization (ITRO) to review computer systems training provided by the four major services (U.S. Army, U.S. Navy, U.S. Marine Corps, and U.S. Air Force). Both Computer Operations (511X0) and Programming (511X1) personnel in each of the four services were surveyed using a common job inventory. The results of the U.S. Air Force portion of this interservice survey are presented in a combined report covering both the 511X0 and 511X1 specialties (AFPT 90-511-413, Vol I). This report concentrates primarily on the results relating to the Programming (AFSC 511X1) specialty. Detailed results of the Computer Operations (AFS 511X0) specialty are provided in a separate report (AFPT 90-511-413, Vol II). A more detailed report covering all services combined will be published at a later date. Additionally, at the request of the Air Force ADP functional manager (HQ USAF/ACD), the tasks performed by Computer Systems Monitors will be closely examined, with the results of this special analysis discussed in greater detail in a supplemental report.

Background

As stated in the current AFR 39-1 Specialty Descriptions, Programming personnel are responsible for developing and preparing computer program routines or procedures, analyzing and designing automated systems, and monitoring functional data systems for the Air Force. They typically prepare program documentation, perform program maintenance, test routines, conduct systems studies, and develop automated data systems. These incumbents are usually assigned at the major command level and concentrate on coding, debugging, testing, desk checking, or documenting computer programs in support of various Air Force requirements. Generally, the number of 511X1 personnel located at any one location depends on the size of the base, the types of equipment used, and the number and nature of the missions needing computer support.

Historically, Programming functions were first authorized in May 1951, as a part of the 832X1 AFSC, Keypunch Machine Operator. From March 1954 to December 1957, Programming personnel were identified by AFSC 682X1, and from December 1957 to January 1972 as AFSC 687X0. In 1972, the 68XXX field was deleted and all computer functions were transferred to a newly created 511XX career field. Currently, the AFSC 511X1 is being utilized to identify Programming Personnel. In 1974, three shreds were authorized at

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the 3- and 5-skill level to differentiate the different computer systems (A-Burroughs, B-Honeywell, C-IBM). This move was made primarily to facilitate technical training and assignment of personnel. However, as a result of the 1977 occupational survey report addressing the feasibility of a simpler career ladder structure, the shreds were replaced in 1978 by Special Experience Identifiers (SEI 425-Burroughs, 426-Honeywell, 427-IBM) to denote the differences in computer systems. In addition, the Computer Systems Analysis and Design functions (AF 511X2) were consolidated into the programming specialty.

Formal training for personnel desiring to enter the 511X1 specialty is available at Keesler AFB MS. This is a 55-day course in which programming personnel are orientated in the areas of: Problem solving, structured programming, COBOL high-order language, advanced topics, system level operations, and project acceptance testing. Upon completion of the 3ABR51131 course, graduates are awarded 3-skill level and assigned to various units worldwide.

Objectives

This report will primarily examine the Programming specialty (AFSC 511X1) on the basis of tasks performed by the survey repondents. However, it is important to note that the survey instrument utilized for this report was a combined 511X0/511X1 survey. As mentioned earlier, the results of the joint 511X0/511X1 and AFS 511X0 analyses are presented in two separate reports (AFPT 90-511-413, Vols I and II). It is highly recommended that users of this report also examine the other two reports in order to better assess the relationship of these specialties.

Topics discussed in this report include: (1) development and administration of the survey instrument; (2) the job structure and its relationship to skill and experience level groupings; (3) CONUS and Overseas differences; (4) comparisons of job structures to current specialty documents, such as AFR 39-1 Specialty Descriptions, the Specialty Training Standard (STS), and the Plan of Instruction (POI); and (5) job satisfaction and other related background data.

II. SURVEY METHODOLOGY

Inventory Development

The data collection instrument for this occupational survey was USAF Job Inventory AFPT 90-511-413. As a starting point, the tasks from the two previous inventories (1973 and 1977) were reviewed and revised through a comprehensive research of publications and directives, and through interviews with training and classification personnel. Personal interviews were conducted with 30 subject matter specialists at Keesler AFB, Sheppard AFB, Randolph AFB, Lackland AFB, Air Force Manpower and Personnel Center (AFMPC), Air Force Data Services Center (AFDSC), and the Air Force Systems Design Center (AFSDC) to review the tentative task list for completeness and accuracy. A joint meeting of subject matter specialists (SMS) and

occupational survey personnel from all services was then conducted to merge individual task lists developed separately by each service. This combined task list was then revalidated by additional SMSs within each service. This process resulted in a final inventory of 577 tasks and a background section that included information about the respondents, such as grade, TAFMS, duty title, organization, computer systems/languages used, and job interest.

Job Inventory Administration

During the period July through November 1979, consolidated base personnel offices in operational units worldwide administered the inventory to job incumbents holding DAFSC 511X0, 511X1, 51199, or CEM Code 51100. These incumbents were selected from a computer generated mailing list obtained from historical AFMPC personnel data tapes maintained by the Air Force Human Resources Laboratory (AFHRL).

Each individual who filled out an inventory first completed an identification and biographical information section and then checked each task performed in their current job. After checking all tasks performed, each member then rated each of these tasks on a nine-point scale showing relative time spent on the task as compared to all other tasks checked. The ratings ranged from one (very small amount of time spent) through five (about average time spent) to nine (very large amount of time spent).

To determine relative time spent for each task checked by a respondent, all of an incumbent's ratings are assumed to account for 100 percent of his or her time spent on the job and are summed. Each task is then divided by the total task ratings and multiplied by 100. This procedure provides a basis for comparing tasks in terms of both percent members performing and relative percent time spent.

Data Processing and Analysis

Once job inventories are returned from the field, they are prepared so that task responses and background information can be optically scanned. Other biographical information (such as name, base, autovon extension, etc.) is keypunched onto disks and entered directly into the computer. Once both sets of data are in the computer, they were merged to form a complete case record for each respondent. Computer generated programs using Comprehensive Occupational Data Analysis Programs (CODAP) techniques were then applied to the data.

CODAP produces job descriptions for respondents based on their responses to specific inventory tasks. Computer generated job descriptions are available for DAFSC groups, TAFMS groups, organizational level groups, activity assigned groups and include such information as percent members performing each task, the average percent time spent performing each task, the percent members utilizing various pieces of equipment or computer language(s), and the cumulative average percent time spent by all members for each task in the inventory.

Task Factor Administration

In addition to completing a job inventory booklet, selected senior 511X1 personnel were also asked to complete a second booklet rating the training emphasis or difficulty of each task. The task difficulty and training emphasis rating booklets are processed separately from the job inventories and this information is then used in a number of different analyses discussed in more detail within the report.

Task Difficulty: Each senior NCO completing a task difficulty booklet was asked to rate all of the tasks on a nine-point scale from extremely low to extremely high as to the relative difficulty of that task. Difficulty is defined as the length of time it requires an average person to learn to do that task. Task difficulty data were independently solicited from experienced 7- or 9-skill level personnel stationed worldwide in each specialty. The interrater reliability (as assessed through components of variance of standard group means) for the 47 Programming raters who returned booklets was .97 and is considered useable by normal reliability criterion. Ratings were then adjusted so that tasks of average difficulty have ratings of 5.0. The resulting data is a rank ordering of tasks indicating a degree of difficulty for each task in the inventory.

Job Difficulty Index (JDI): After computing a task difficulty value for each item, it is then possible to compute a Job Difficulty Index (JDI) for the job groups identified in the survey analysis. This index provides a relative measure of which jobs, when compared to other jobs identified, are more or less difficult. An equation using the number of tasks performed and the average difficulty per unit time spent as variables are the basis for the JDI. This index ranges from one for very easy jobs to 25 for very difficult jobs. The indices are adjusted so that the average job difficulty index is 13.00. Thus, the more time a group spends performing difficult tasks, and the more tasks they perform, the higher will be their job difficulty index. The JDI ratings for the 511X1 specialty can be found in the JOB STRUCTURE section of this report.

Training Emphasis: Senior programmers completing training emphasis booklets were asked to rate all of the tasks on a ten-point scale from no training required to extremely heavy training required. Training emphasis is a rating of tasks indicating where emphasis should be placed on structured training for first-term personnel. Structured training is defined as training provided at resident technical schools, Field Training Detachments (FTD), Mobile Training Teams (MTT), formal OJT, or any other organized training method. Training emphasis data were independently solicited from experienced 7- or 9-skill level personnel stationed worldwide. The interrater reliability (as assessed through components of variance of standard group means) for these raters was also high (.94), indicating that there was good agreement among the raters as to which tasks required some form of structured training and which did not. Tasks rated by the 50 Programming personnel returning training emphasis booklets had an average training emphasis rating of 1.0 and a standard deviation of 1.0. (The low average ratings are largely a function of surveying two specialties in the same instrument; this does not affect the relative ordering of tasks by emphasis recommended, which is the main objective.)

When used in conjunction with other factors, such as percent members performing, the task difficulty and training emphasis ratings can provide insight into the training requirements of specialty. This may help validate the lengthening or shortening of specific units of instruction to refine various training programs.

Survey Sample

Personnel were selected to participate in this survey so as to insure an accurate representation across all MAJCOM and paygrade groups. In this study, a stratified random sample of all incumbents with a 511X1 DAFSC were surveyed. Table 1 reflects the major command distribution of personnel assigned to the 511X1 career ladder as of December 1979. Table 2 reflects the percentage distribution by paygrade. Table 3 reflects the distribution of the survey sample in terms of TAFMS groups. Overall, an adequate sample was obtained, with 914 of the 1,587 respondents assigned to this specialty (58 percent) responding.

TABLE 1

COMMAND REPRESENTATION OF SURVEY SAMPLE

COMMAND	PERCENT ASSIGNED	PERCENT SAMPLED
AFCC	17	18
SAC	14	12
TAC	13	12
AFSC	11	11
USAFE	9	9
ATC	7	11
ADCOM	7	7
MAC	5	6
HQ USAF	5	3
PACAF	4	3
ESC	3	3
AFLC	2	3
AAC	1	1
OTHER	2	1
TOTAL	100%	100%

TOTAL 511X1 ASSIGNED - 1,587
TOTAL 511X1 SAMPLED - 914
PERCENT OF 511X1 SAMPLED - 58%

TABLE 2

PAYGRADE DISTRIBUTION OF SURVEY SAMPLE

PAYGRADE	PERCENT ASSIGNED	PERCENT SAMPLED
AIRMAN	14	14
E-4	24	25
E-5	32	28
E-6	19	19
E-7	11	14
E-8	*	*
E-9	*	0
TOTAL	100%	100%

* INDICATES LESS THAN ONE PERCENT

TABLE 3

AFMS DISTRIBUTION OF SURVEY SAMPLE

	MONTHS TIME IN SERVICE			
	1-48	49-96	97+	TOTAL
NUMBER IN SAMPLE	231	235	448	914
PERCENT OF 511X1 SAMPLED	25%	26%	49%	100%

III. RESULTS

JOB STRUCTURE ANALYSIS

A key aspect of the USAF occupational analysis program is to examine the structure of specialties, what people are actually doing in the work environment rather than how official career field documents say they are organized. This analysis is made possible by the Comprehensive Occupational Data Analysis Programs (CODAP). By using CODAP, jobs are identified on the basis of similarity in tasks performed and the relative time spent performing those tasks. The information is then used to examine the accuracy and completeness of present career field documents (AFR 39-1 Specialty Descriptions, Specialty Training Standards, etc.), and to formulate an understanding of current utilization patterns.

The specialty structure analysis process consists of determining the functional job structure of specialty personnel in terms of job types, clusters, and independent job types. A job type is a group of individuals who perform many of the same tasks and who spend similar amounts of time performing these tasks. When there is a substantial degree of similarity between different job types, they are grouped together in a Cluster. Finally, there are often specialized jobs that are too dissimilar to be grouped into any cluster. These unique groups are labeled Independent Job Types.

Specialty Structure Overview

The job structure for the Programming specialty was determined from a job type analysis of 3,463 respondents in the Computer Systems (AFSCs 511X0, 511X1, 51199, and CEM Code 51100) career field. The entire career field (two specialties and senior level personnel) was analyzed together to determine the job groups unique to each specialty and also to determine if there are any jobs commonly performed by both 511X0 and 511X1 personnel. This report will concentrate on the jobs performed by the 511X1 personnel. For a more thorough discussion of the joint 511X0-511X1 job structure, see the two companion reports concerning the Computer Systems career field (AFPT 90-511-413, Vols I and III).

Based on task similarity and the amount of time spent performing each task, the jobs performed by 511X1 respondents are listed below and illustrated in Figure 1. (GRP numbers are shown with each group as a cross-reference to computer printed summaries used in the analysis of the survey data.)

FIGURE 1

COMPUTER PROGRAMMING JOB STRUCTURE

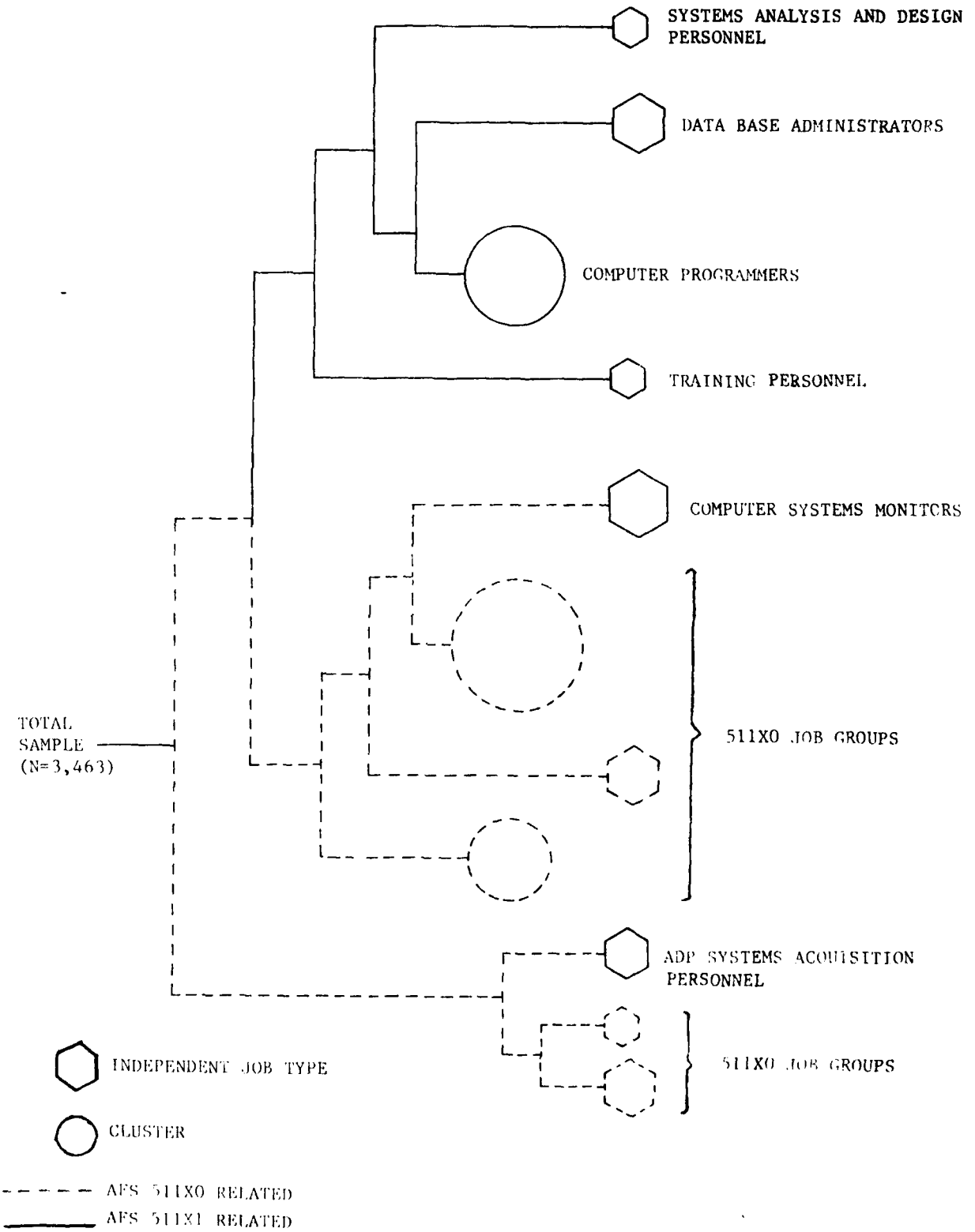
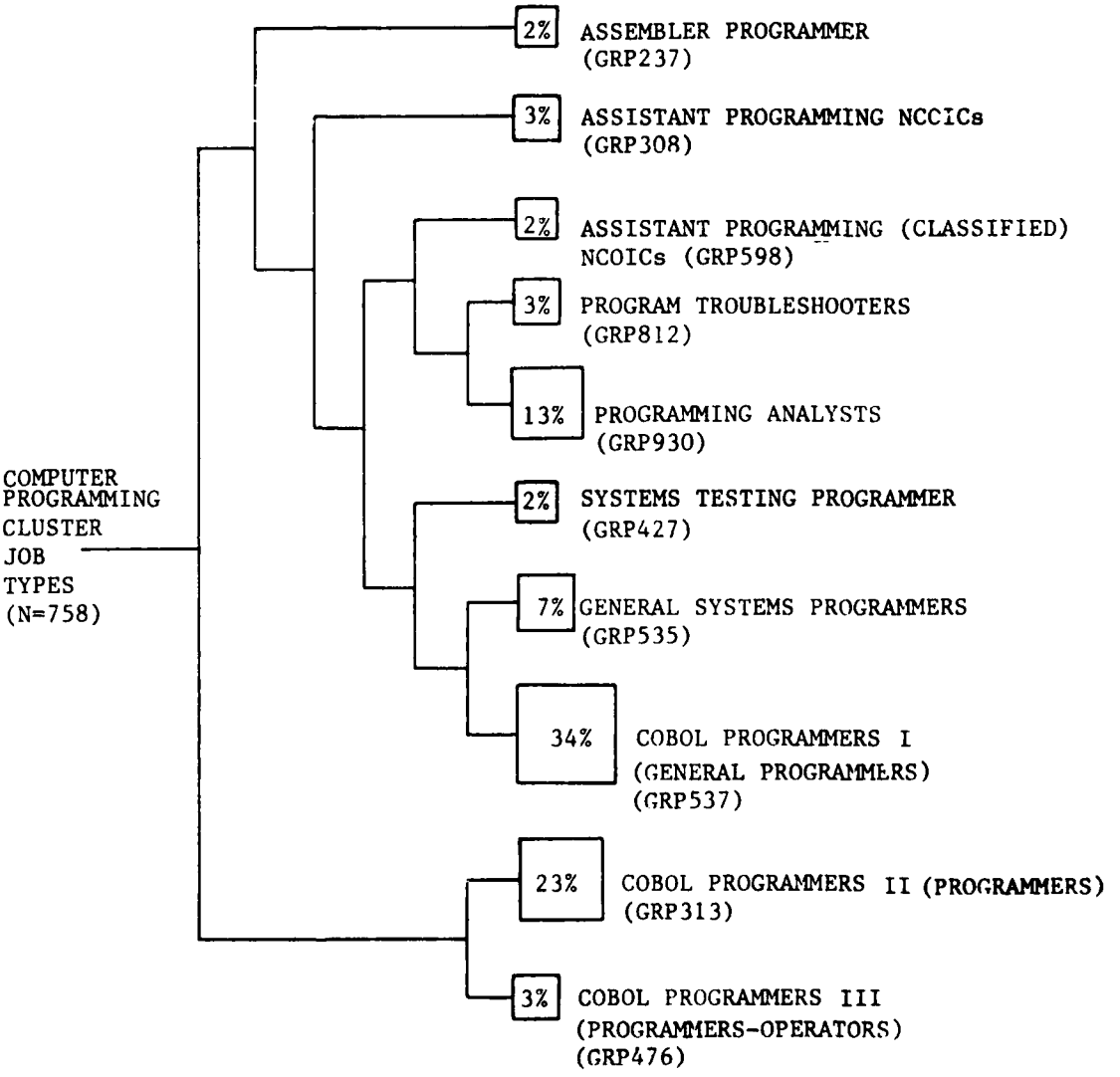


FIGURE 2

COMPUTER PROGRAMMER CLUSTER JOB TYPES



I. COMPUTER PROGRAMMERS (GRP134, N=758)

a. COBOL Programmers I (General Programmers) (GRP537, N=256)
b. COBOL Programmers II (Programmers) (GRP313, N=171)
c. COBOL Programmers III (Programmer-Operators) (GRP476, N=20)
d. ASSEMBLER Programmers (GRP237, N=15)
e. General Systems Programmers (GRP535, N=50)
f. Programming Analysts (GRP930, N=101)
g. Systems Testing Programmers (GRP427, N=12)
h. Program Troubleshooters (GRP812, N=25)
i. Assistant Programming (Classified) NCOICs (GRP598, N=12)
j. Assistant Programming NCOICs (GRP308, N=24)

II. TRAINING PERSONNEL (GRP170, N=22)

III. DATA BASE ADMINISTRATORS (GRP218, N=15)

IV. SYSTEMS ANALYSIS AND DESIGN PERSONNEL (GRP264, N=13)

V. ADP SYSTEMS ACQUISITION PERSONNEL (GRP216, N=12)

VI. COMPUTER SYSTEMS MONITORS (GRP101, N=335)

The respondents forming these job types and clusters account for approximately 82 percent of the 511X1 survey sample. An additional six percent of the 511X1 sample fell into predominately 511X0 job groups, while the remaining 12 percent of the sample consists of unique jobs which did not group with any of the job types or clusters listed above. Some of the titles held by the remaining 12 percent were: Software Programming, Program Audit, Systems Evaluation, Quality Control, and Phase IV Management.

Cluster and Independent Job Type Descriptions

Brief descriptions of each cluster and independent job type are presented below. Tables 4 through 8 at the end of this section reveal additional information about the groups identified. Appendix A lists representative tasks performed by all of the clusters and independent job types described in this section.

I. COMPUTER PROGRAMMERS CLUSTER. Members of this large cluster represent the core of the 511X1 specialty. Eighty-seven percent of the members hold DAFSC 511X1 with an additional ten percent being AFS 51199 or CEM Code 51100 personnel. Common tasks performed by the cluster members are:

debug computer programs
test computer programs
compile or assemble programs
desk check programs
modify or update existing computer programs
code computer programs in higher level languages
prepare documentation for individual programs
determine causes of program halts or abends

Overall, 65 percent of the respondents indicated using Top Down Design and Structured Programming (TDSP) procedures, with the most commonly utilized languages being COBOL, FORTRAN, and ASSEMBLER. Stationed primarily at the MAJCOM level, these people perform one of the most difficult jobs identified in the survey.

The Computer Programming cluster may be differentiated into the ten job types illustrated in Figure 2. These groups are distinguishable by the varying emphasis placed on different computer systems functions, in areas such as programming, analysis, and computer operations. Tables 9 through 12 provide background and related information for the job type groups within the cluster.

Five of the ten job types were formed based on the performance of primarily programming tasks. The tasks performed by these respondents focus primarily on those programming tasks listed above as being representative of the cluster. The amount of time spent on these tasks in combination with other related functions (i.e., operations), and various background factors (i.e., computer language utilized), distinguish these job types.

General Systems Programmers (GRP535) indicated using various languages, such as ASSEMBLER, COBOL, and FORTRAN, while concentrating their time in operations related tasks such as:

address or call system via console to request information
participate with programmers in testing or debugging programs
convert or record data from one media to another
load programs or data from disks

Located primarily at Research/Development activities, 34 percent of this group are in their first enlistment.

Assigned to Command and Control activities, ASSEMBLER Programmers (GRP237), utilize the ASSEMBLER and MACRO II languages the most, with only 40 percent using TDSP procedures. This group also focuses a majority of their time on operations-related tasks, which include:

loading program or data from tapes
enter data or programs into computer via console
analyze console printouts to identify computer stoppages
punch cards

Indicating high job interest, the felt utilization of talents and training of this job type is lower than other job types identified.

Three groups concentrated in the use of the COBOL programming language. These job types contain 68 percent of all first enlistment personnel in the cluster, and are assigned predominately to Data Automation, the Data Service Center, and the Data Systems Design Center. Representing the bulk of the Programming cluster, COBOL Programmers I (General Programmers), and COBOL Programmers II (Programmers) spend a majority of their time in programming functions, such as those representative of the cluster. While maintaining a central focus in COBOL programming, the COBOL Programmers I

indicate their time being spent in several additional functions such as analysis, operations, and production control. This diversity of responsibility is also indicated in the groups performance of more average tasks (63) than other COBOL programming groups. COBOL Programmers II concentrate their time in programming, spending more time on fewer tasks (27). COBOL Programmers III, on the other hand, are more programmer-operators, spending more time in operations tasks than any other job type. Tasks distinguishing the group are those previously mentioned as characteristic of other operator-related groups (Assembler Programmers and General Systems Programmers). The personnel in the COBOL Programming III group also indicate lower job satisfaction responses than most other job types identified, possibly caused by working in operations-orientated environments.

Job types performing specialized functions, such as Programming Analysts (GRP930), Program Troubleshooters (GRP812), and Systems Testing Programmers (GRP427) have more difficult jobs than other technically related job types identified. Programming Analysts perform more tasks than other job types in the cluster, a probable determinant of their high Job Difficulty Index. Concentrating most of their time in analysis functions and utilizing the COBOL language, this group is best distinguished by their performance of tasks like:

estimate program systems requirements
design error handling routines
prepare input or output file specifications
prepare or revise program maintenance manuals
design input or output formats, such as card, printed, or microform report formats

Systems Testing Programmers have the highest job satisfaction responses of any job type in the cluster. While also concentrating a majority of their time in analysis functions, this group performs tasks such as:

prepare system test data
analyze or review system test results
prepare or revise program operation manuals
test program and sub-system interface
prepare plans to test hardware interface

Being the most experienced technically-orientated group, these respondents have an average grade of E-6 or E-7 and utilize the ASSEMBLER and COBOL programming languages. On the other hand, Program Troubleshooters utilize many different programming languages (ASSEMBLER, COBOL, FORTRAN, and GMAP) and place an emphasis on operations-related tasks:

isolate causes of machine stops or malfunctions
interrogate memory location via console action
notify programmers or analysts of processing problems
analyze console printouts to indentify computer stoppages
correct stoppages on printers

Two job types within the cluster involve supervisory functions but are distinguished from each other by the classified or unclassified nature of the programming involved. Both have an average grade of E-6, E-7, and have no one in their first enlistment. Assistant Programming NCOICs (GRP308) are located primarily at Data Automation organizations. Tasks representative of supervising most commonly performed include:

supervise personnel performing programming duties
inspect personnel for military appearance
schedule leave or liberty
make work assignments
counsel personnel

Some descriptive background factors include utilization of the COBOL programming language and TDSP procedures. Interestingly, these job type members indicated the lowest job interest in the cluster. As compared to the Assistant Programming (Classified) NCOICs (GRP598) indicated an extremely high job interest and are located primarily at Command and Control or Intelligence activities. Additional tasks differentiating these supervisors are:

store or safeguard classified material
supervise personnel handling classified material
stamp security classification on material

This group of supervisors also differed from the Assistant Programming NCOICs in that they indicated using the ASSEMBLER and JOVIAL programming languages.

II. TRAINING PERSONNEL. Having the highest average grade (E-6, E-7) of any 511X1-related group, members of this independent job type average 152 months in the service, and are located primarily at ATC bases. These 22 respondents grouped on the basis of performing training related tasks, such as:

construct training aids
prepare training lectures
prepare training tests or examinations
define training requirements
grade training tests or examinations
administer training tests or examinations
plan or schedule training programs
evaluate training methods, techniques, or programs

While 73 percent of the group are DAFSC 511X1 personnel, 22 percent hold a 511X0 AFSC, and the remaining five percent are 51199 personnel. Interestingly, only 50 percent of the group performed programming tasks, with the COBOL language being predominate.

III. DATA BASE ADMINISTRATORS. In this programming-related independent job type, only 53 percent of the group indicate programming responsibilities. Additionally, of those indicating that they programmed, COBOL and FORTRAN are the most utilized languages and only 13 percent indicated using TDSP procedures. Covering a wide range of duty functions, the tasks most commonly performed include:

review changes to data base
modify or update existing computer programs
input, update, or retrieve data using remote inquiry units
assemble, rearrange, or edit input or output data
code job control language
test computer programs
batch run requests

When compared to other 511X1 job groups, these respondents have low job satisfaction responses. This is possibly indicative of somewhat ill-defined job responsibilities. This is substantiated when looking at the tasks listed above and the representative tasks in the Appendix A. Tasks responded to by these people do not show a central job focus which is apparent in other job groups. As shown in Appendix A, the percent members performing each task is not as homogeneous as other groups.

IV. SYSTEMS ANALYSIS AND DESIGN PERSONNEL. These 13 respondents all hold DAFSC 511X1 or 51199 and spend 53 percent of their time on analysis functions. Seventy percent of the members hold a 7-skill level. Having a high computed Job Difficulty Index (16.8) and performing an average of only 59 tasks indicates the performance of relatively difficult tasks. Most of the tasks performed by group members were previously performed by members of the 511X2 specialty which was consolidated into the 511X1 specialty in October 1978. Examples of these tasks include:

prepare system narratives
conduct design analysis or project team meetings
prepare or revise program operations manual
conduct systems design status briefings
prepare or revise systems specifications
prepare system narratives
review program specifications
review program requirements

Although group members indicate high job interest, they also reflect a somewhat low utilization of training. A majority of the group (70 percent) indicated programming, of which 62 percent use TDSP procedures. The use of the ASSEMBLER language was indicated as being predominate.

V. ADP SYSTEMS ACQUISITION PERSONNEL. These 12 incumbents are primarily involved with the planning and implementation of computer systems. Respondents are somewhat unique due to the large percentage of time spent (36 percent) performing analysis tasks. It is interesting to note that while these incumbents average 191 months TAFMS and indicate spending 41 percent of their time in tasks designated as supervisory functions, they do not supervise anyone. This trend indicates an experienced technician-level group rather than a purely supervisory group. Tasks commonly performed by these incumbents include:

Prepare, coordinate, and review data automation requirements (DARs)
Prepare, coordinate, and review data project plans (DPPs)
Prepare, coordinate, and review data project directives (DPDs)
Review recommendations for needed data systems equipment
Prepare recommendations for size and capacity of proposed ADP equipment

Only eight percent of the group perform programming tasks, which explains the large degree of task overlap with the 511X0 specialty. Broken down by AFSC, 42 percent of the group have a 511X0 DAFSC, 33 percent hold a DAFSC 511X1 and the remaining 25 percent are 51199 or CEM Code level personnel. This distribution seems realistic, since both operator and programming inputs are needed when implementing computer systems.

VI. COMPUTER SYSTEMS MONITORS. Of the 335 respondents who make up this independent job type, only 50 incumbents (15 percent) hold the 511X1 AFSC. These incumbents perform a liaison role between the personnel requesting computer products and the computer operators. These personnel are primarily stationed at base data processing installations, and serve a production control function by insuring that computer requests are processed correctly and that output products are sufficient and accurate. Spending most of their time in production control (41 percent) and operations (22 percent) functions, only 13 percent of the group indicated performing any programming. These respondents' perform such tasks as:

respond to inquiries from customers
resolve production problems with customers
notify customers of production problems
notify customers of job completion
determine cause of faulty output products
report computer input data content errors to customers
coordinate with OPRs

Specialty Structure Summary

Table 4 shows the relative percent time spent on duties, and helps to identify which functional areas personnel in the clusters and independent job types concentrate on. For example, Systems Analysis and Design Personnel spend 53 percent of their job time performing analysis tasks, while Training Personnel spend 51 percent of their time on training related tasks. Table 5 contrasts various background information about the major job groups identified, such as average paygrade, DAFSC distribution, and average months TAFMS. For example, personnel in the Computer Programmers cluster perform an average of 70 tasks, 21 percent supervise at least one subordinate, 42 percent hold the 7-skill level, and average 99 months TAFMS. Table 6 displays various job satisfaction data for major job groups, and can be used to identify those jobs having high or low job satisfaction. In this case, Data Base Administrators and Computer Systems Monitors seem to have the lowest job satisfaction of any group, with perceived job interest, perceived utilization of talents and training, and reenlistment intentions generally being lower than for other major job groups. The most common computer programming languages utilized by major job groups are listed in Table 7. This table reveals that COBOL, FORTRAN, and ASSEMBLER are the most utilized computer languages, with at least eight percent of the members in each cluster and independent job type using these languages. Table 8 displays the organizational level in which major job group personnel are working. Computer Programmers are somewhat unique in that they report having personnel located primarily at the MAJCOM level.

Tables 9 through 12 display various duty, background, and job satisfaction information about the job types identified in the Programming cluster.

Data analysis for the Programming specialty reflects a homogeneous specialty structure. Overall, the jobs within the Programming specialty can be described as interrelated in terms of the tasks performed. While some specialization does occur within the specialty, it is clear that the majority of 511X1 incumbents perform a variety of programming tasks. Overlap of responsibilities between the 511X0 and 511X1 specialties is apparent, as might be expected since programmers must by necessity perform some operator-related tasks. Those jobs which overlap in technical areas, such as ADP Systems Acquisition and Computer Systems Monitors, may need to be reviewed to determine which AF specialty is best suited to perform these responsibilities. The functions of Data Base Administrators are not clearly distinguished by the tasks and may also require some attention. A majority of the Programming specialty incumbents do perform very distinct jobs constituting three primary groups; Computer Programming, Systems Analysis and Design, and Training. Job satisfaction levels for most groups was high but retention (as reflected by intent to reenlist) may be a problem.

TABLE 4

RELATIVE PERCENT TIME SPENT PERFORMING DUTIES BY MAJOR JOB STRUCTURE GROUPS

DUTIES	COMPUTER PROGRAMMERS	SYSTEMS ANALYSIS & DESIGN PERSONNEL	COMPUTER SYSTEMS MONITORS	DATA BASE ADMINISTRATORS	ADP SYSTEMS ACQUISITION PERSONNEL	TRAINING PERSONNEL
PROGRAMMING FUNCTIONS	(37)	23	7	18	1	15
ANALYSIS FUNCTIONS	17	(53)	6	8	(36)	4
OPERATOR FUNCTIONS	20	2	(22)	25	2	13
PRODUCTION CONTROL FUNCTIONS	10	3	(41)	18	2	3
SUPERVISORY FUNCTIONS	5	9	8	4	(41)	6
SECURITY FUNCTIONS	4	2	6	17	*	2
TRAINING FUNCTIONS	3	4	1	2	1	(51)
GENERAL MILITARY FUNCTIONS	2	1	3	3	2	4
SUPPLY OR CONTRACTING FUNCTIONS	*	*	1	*	2	*
LIBRARY FUNCTIONS	1	0	3	1	*	*
ADMINISTRATIVE FUNCTIONS	1	2	2	4	(12)	2

* INDICATES LESS THAN ONE PERCENT

TABLE 5

BACKGROUND INFORMATION FOR MAJOR JOB STRUCTURE GROUPS

	SYSTEMS ANALYSIS & DESIGN PERSONNEL	COMPUTER PROGRAMMERS	TRAINING PERSONNEL	DATA BASE ADMINISTRATORS	ADP SYSTEMS ACQUISITION PERSONNEL	COMPUTER SYSTEMS MONITORS
JOB DIFFICULTY INDEX	16.8	15.8	12.8	11.1	11.1	11.0
AVERAGE NUMBER OF TASKS PERFORMED	59	70	44	45	25	58
PERCENT SUPERVISING	23%	21%	27%	17%	none	21%
AVERAGE PAYGRADE	E-6	E-5	E-5, E-6	E-5	E-6	E-4
DAFSC						
51131	0	5%	0	0	0	1%
51151	15%	40%	14%	53%	8%	8%
51171	70%	42%	59%	27%	25%	6%
51199	15%	8%	5%	7%	17%	1%
CEM CODE 51100	0	2%	0	0	8%	0
511X0	0	3%	22%	13%	42%	84%
AVERAGE MONTHS TAFMS	174	99	152	120	191	73
PERCENT IN FIRST ENLISTMENT	8%	26%	5%	33%	none	39%

TABLE 6

JOB SATISFACTION DATA FOR MAJOR JOB STRUCTURE GROUPS
(PERCENT MEMBERS RESPONDING)

	SYSTEMS ANALYSIS & DESIGN PERSONNEL	COMPUTER PROGRAMMERS	TRAINING PERSONNEL	DATA BASE ADMINISTRATORS	ADP SYSTEMS ACQUISITION PERSONNEL	COMPUTER SYSTEMS MONITORS
I FIND MY JOB:						
DULL	8	6	18	8	20	14
SO-SO	7	12	5	17	7	16
INTERESTING	85	82	77	75	73	70
MY JOB UTILIZES MY TALENTS:						
NOT AT ALL TO VERY LITTLE	15	16	18	17	33	39
FAIRLY WELL OR BETTER	85	84	82	83	67	61
MY JOB UTILIZES MY TRAINING:						
NOT AT ALL TO VERY LITTLE	38	20	18	42	73	70
FAIRLY WELL OR BETTER	62	80	82	58	(27)	(30)
I PLAN TO REENLIST:						
NO OR PROBABLY NO	54	54	27	25	73	43
YES OR PROBABLY YES	46	46	73	75	(27)	57

TABLE 7

COMPUTER PROGRAMMING LANGUAGES UTILIZED BY MAJOR JOB STRUCTURE GROUPS
(PERCENT MEMBERS RESPONDING)

	COMPUTER PROGRAMMERS	SYSTEM ANALYSIS & DESIGN PERSONNEL	DATA BASE ADMINISTRATORS	TRAINING PERSONNEL	COMPUTER SYSTEMS MONITORS	ADP SYSTEMS ACQUISITION PERSONNEL
PERSONNEL PERFORMING PROGRAMMING:						
USE TDSP	65	62	13	36	8	3
DO NOT USE TDSP	32	8	40	14	0	10
PROGRAMS MOST UTILIZED:						
COBOL	57	31	33	36	8	8
FORTRAN	12	8	20	0	0	2
ASSEMBLER	11	31	0	0	0	1
GMAP	4	0	0	14	0	0
JOVIAL	4	0	7	5	0	0
PROGRAMS UTILIZED:						
COBOL	74	23	33	46	8	7
FORTRAN	33	23	27	41	0	2
ASSEMBLER	25	54	0	5	0	0
GMAP	13	0	7	23	0	0
BASIC	11	0	0	9	0	1
JOVIAL	6	0	0	5	0	0
PLI	5	0	0	9	0	0
RPG	3	8	0	5	0	0
DUEL	3	8	0	0	0	0
MACRO II	3	0	0	9	0	0
DO NOT PERFORM PROGRAMMING:	3	30	47	50	92	87

TABLE 8

ORGANIZATIONAL LEVEL OF MAJOR JOB STRUCTURE GROUPS
(PERCENT MEMBERS RESPONDING)

ORGANIZATIONAL LEVEL	ADP SYSTEMS ACQUISITION PERSONNEL	SYSTEMS ANALYSIS & DESIGN PERSONNEL	COMPUTER PROGRAMMERS	TRAINING PERSONNEL	DATA BASE ADMINISTRATORS	COMPUTER SYSTEMS MONITORS
MAJCOM	84	62	50	23	20	15
WING	0	0	5	5	33	7
BASE DATA PROCESSING	0	0	7	9	7	68
SEPARATE OPERATING AGENCIES	8	8	12	0	0	2
DOD/JOINT SERVICES	0	15	4	5	20	2
HQ USAF	8	0	4	0	7	2
OPERATING LOCATION/REMOTE SITE	0	8	3	9	0	*
NORAD	0	0	2	0	0	*
OTHER	0	7	13	49**	12	4

* INDICATES LESS THAN ONE PERCENT
** INCLUDES PRIMARILY TECHNICAL TRAINING CENTERS

ANALYSIS OF DAFSC GROUPS

In conjunction with identifying the job structure of the Programming specialty, it is also important to examine differences among skill level groups. The DAFSC analysis provides information used to analyze how accurately specialty documents, such as AFR 39-1 specialty descriptions and the Specialty Training Standards (STS), reflect the tasks and jobs performed by specialty incumbents in the field.

The DAFSC analysis of the 511X1 specialty will discuss the duties and tasks common to the DAFSC groups, as well as the tasks which best differentiate the 3,- 5-, and 7-skill level respondents. The senior level respondents (AFSC 51199 or 51100) are discussed in detail in the combined report (AFPT 914-511-413, Vol I) of the 511XX career field. Many operations and production control tasks are common across both the 511X0 and 511X1 specialties (see Appendix B), in addition to several programming tasks which are common across all 511X1 skill level groups (see Table 14).

Skill Level Descriptions

DAFSC 51131. As in most specialties 3-skill level respondents perform jobs which are technical in nature. Common tasks performed indicated debugging, desk checking, compiling, assembling, or testing computer programs; coding computer programs in higher level languages or job control languages; and determining causes of program halts or abends. Three-skill level personnel were found primarily in one job group-the Computer Programming Cluster. Within the Computer Programming Cluster, the 3-skill level respondents tended to concentrate in the COBOL programming (see Table 13) job types.

DAFSC 51151. At the 5-skill level, personnel are still found primarily in the Computer Programmers cluster (75 percent) performing technically-related tasks. However, other 5-skill level respondents were now working in the Computer Systems Monitor, Computer Operations, and Data Base Administrator areas. While they were performing many of the same tasks as performed by 3-skill level respondents, tasks such as prepare or revise program maintenance or operations manuals and estimating program requirements were more indicative of the 5-skill level (see Table 15).

DAFSC 51171. At the 7-skill level, personnel continue to expand into Systems Testing, Training, and limited supervisory responsibilities. The task differences illustrated on Table 16 distinguish 5- and 7-skill levels, but do not indicate any large differences in terms of tasks performed. Those tasks with the greatest differences are performed by 34 percent or less of either skill level, indicating they are marginally indicative of any differences. Unlike many other specialties, the 7-skill level programmer is not involved a great deal in supervisory functions (see Figure 3), indicating these respondents perform a technically dominated function more so than their counterpart in other specialties.

Summary of DAFSC Groups

In the analysis of skill level groups, each skill level performs primarily the same common core of programmer and operations tasks (see Table 14 and Appendix B), indicating it to be a rather homogeneous specialty. As 511X1 personnel progress from the 3- to the 7-skill level, the diversity of possible jobs also increases. Five and 7-skill level respondents extend into various specialized types of jobs and corresponding tasks, but still remain technically orientated. While all skill levels are concentrated in the Computer Programming cluster, the 5-skill level branches out into the Computer Systems Monitor and Data Base Administrator groups, while the 7-skill level respondent is also found in Training, ADP Systems Acquisition, and Management job groups. It is not until the 51199 or CEM Code level do these personnel spend a substantial amount of time in supervisory or management duties. Along with this, an increase in time spent performing analysis functions, and a decrease in performing programming and operations functions also occurs.

FIGURE 3

RELATIVE PERCENT TIME SPENT ON DUTIES

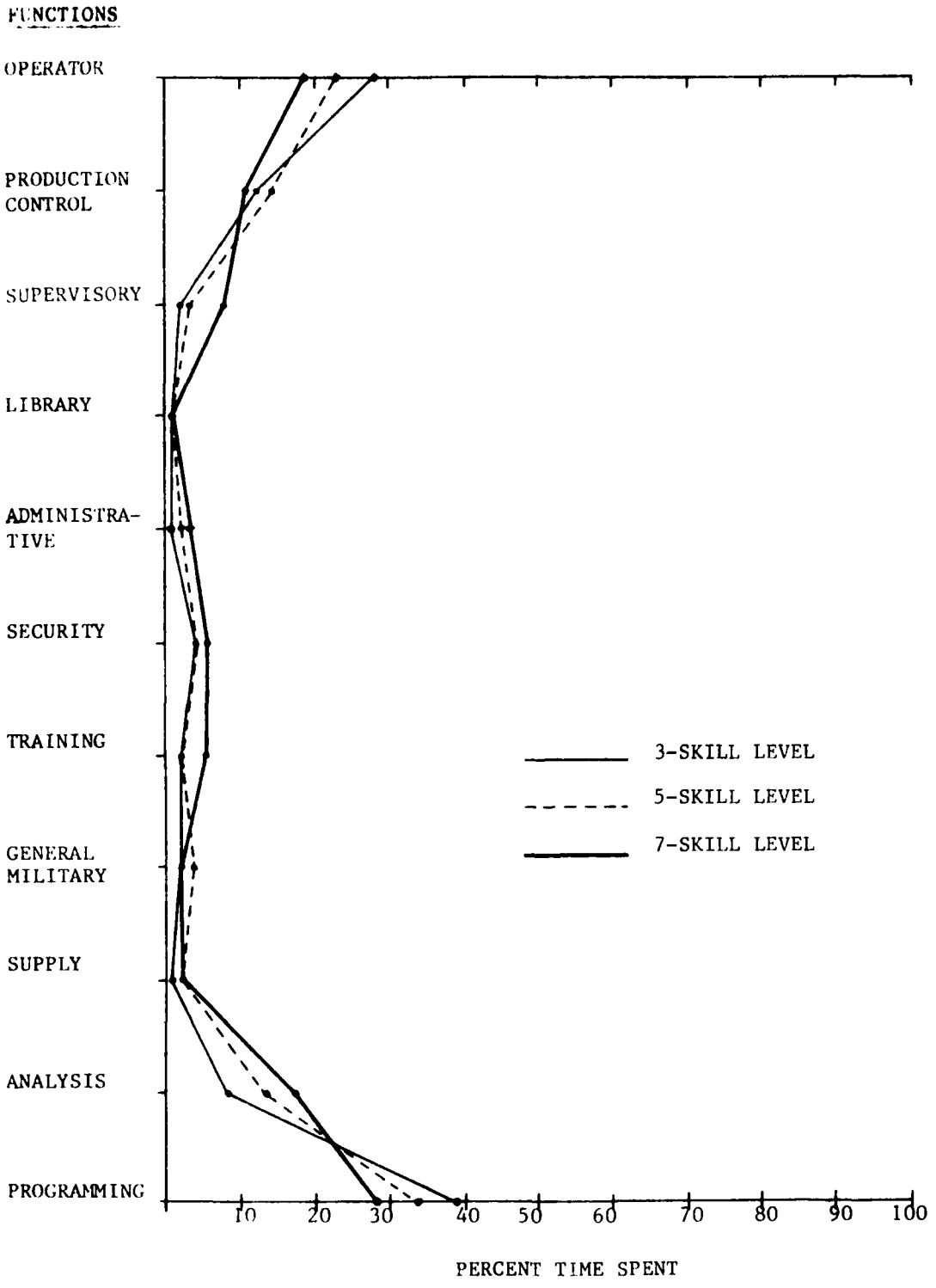


TABLE 9

RELATIVE PERCENT TIME SPENT PERFORMING DUTIES BY JOB TYPES IN THE COMPUTER PROGRAMMING CLUSTER

	PROGRAMMERS (COBOL II)	GENERAL PROGRAMMERS (COBAL I)	SYSTEMS TESTING PROGRAMMERS	PROGRAMMING ANALYSTS	PROGRAMMER-OPERATORS (COBOL III)	GENERAL SYSTEMS PROGRAMMERS	ASSEMBLER PROGRAMMERS	PROGRAM TROUBLE-SHOOTERS	ASSISTANT PROGRAMMING NCOICs	ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs
PROGRAMMING FUNCTIONS	(55)	(37)	31	24	30	33	27	23	22	20
ANALYSIS FUNCTIONS	10	19	(34)	(30)	5	10	6	16	20	11
OPERATOR FUNCTIONS	17	18	16	13	(43)	(36)	(35)	(34)	7	19
PRODUCTION CONTROL FUNCTIONS	7	12	*	10	10	9	7	13	6	5
SUPERVISORY FUNCTIONS	*	*	7	8	*	*	5	*	(25)	(13)
SECURITY FUNCTIONS	*	*	*	*	*	*	6	*	*	(10)
TRAINING FUNCTIONS	*	*	*	*	*	*	8	*	8	(11)
ADMINISTRATIVE FUNCTIONS	*	*	*	*	*	*	*	*	*	*
GENERAL MILITARY FUNCTIONS	*	*	*	*	*	*	*	*	5	*
LIBRARY FUNCTIONS	*	*	*	*	*	*	*	*	*	*
SUPPLY OR CONTRACTING FUNCTIONS	*	*	*	*	*	*	*	*	*	*

* INDICATES LESS THAN FIVE PERCENT TIME SPENT

TABLE 10

BACKGROUND INFORMATION FOR JOB TYPES IN THE COMPUTER PROGRAMMING CLUSTER

	PROGRAMMING ANALYSTS	PROGRAM TROUBLE-SHOOTERS	ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs	SYSTEMS TESTING PROGRAMMERS	ASSISTANT PROGRAMMING NCOICs	GENERAL SYSTEMS PROGRAMMERS	GENERAL PROGRAMMERS (COBOL I)	ASSEMBLER PROGRAMMERS	PROGRAMMERS (COBOL II)	PROGRAMMER-OPERATORS (COBOL III)
JOB DIFFICULTY INDEX	22.7	21.1	21.1	17.6	17.6	15.9	15.5	14.6	11.5	10.5
AVERAGE NUMBER OF TASKS PERFORMED	146	130	125	72	80	73	63	63	27	34
AVERAGE PAYGRADE	E-5	E-5	E-6,E-7	E-6,E-7	E-6,E-7	E-4,E-5	E-4,E-5	E-5,E-6	E-4,E-5	E-4,5
DAFSC										
51131	1%	4%	-	7%	-	6%	3%	7%	9%	15%
51151	35%	48%	-	8%	4%	46%	49%	40%	43%	40%
51171	51%	32%	92%	55%	63%	38%	39%	33%	40%	35%
51199	7%	4%	8%	22%	21%	0	6%	13%	5%	-
51100	2%	-	-	8%	8%	4%	1%	-	1%	-
511X0	4%	12%	-	-	4%	6%	2%	7%	2%	10%
AVERAGE MONTHS TAFMS	128 MOS	119 MOS	212 MOS	195 MOS	204 MOS	100 MOS	100 MOS	134 MOS	108 MOS	107 MOS
PERCENT IN FIRST ENLISTMENT	23%	20%	NONE	NONE	NONE	34%	34%	20%	28%	20%

TABLE 11

JOB SATISFACTION DATA FOR JOB TYPES IN THE COMPUTER PROGRAMMING CLUSTER
(PERCENT MEMBERS RESPONDING)

	SYSTEMS TESTING PROGRAMMERS	ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs	ASSEMBLER PROGRAMMERS	GENERAL PROGRAMMERS (COBOL I)	PROGRAM TROUBLE-SHOOTERS	PROGRAMMING ANALYSTS	GENERAL SYSTEMS PROGRAMMERS	PROGRAMMERS (COBOL II)	PROGRAMMER-OPERATORS (COBOL III)	ASSISTANT PROGRAMMING NCOICs
I FIND MY JOB:										
NO RESPONSE	0	0	0	3	8	5	4	1	5	13
DULL	0	0	7	5	0	6	2	7	15	8
SO-SO	0	8	7	7	8	5	10	11	15	8
INTERESTING	100	92	86	85	84	84	84	81	65	71
MY JOB UTILIZES MY TALENTS:										
NO RESPONSE	0	0	9	0	0	2	0	0	0	0
NOT AT ALL TO VERY LITTLE	0	0	27	16	24	12	12	14	25	19
FAIRLY WELL OR BETTER	100	100	64	84	76	86	88	86	75	81
MY JOB UTILIZES MY TRAINING:										
NO RESPONSE	0	8	7	2	0	0	0	1	0	0
NOT AT ALL TO VERY LITTLE	2	17	40	14	36	20	28	18	30	26
FAIRLY WELL OR BETTER	98	75	53	84	64	80	72	81	70	74
I PLAN TO REENLIST:										
NO RESPONSE	0	0	7	1	0	1	0	1	0	4
NO OR PROBABLY NO	58	50	53	60	60	50	58	50	35	33
YES OR PROBABLY YES	42	50	40	39	40	49	42	49	65	63

TABLE 12

MOST USED PROGRAMMING LANGUAGES UTILIZED BY JOB TYPES IN THE COMPUTER PROGRAMMING CLUSTER
(PERCENT MEMBERS SELECTING)

COMPUTER PROGRAMMER JOB TYPES	DO NOT PERFORM PROGRAMMING	PERCENT USING TDSP PROCEDURES	COBOL	ASSEMBLER	FORTRAN	GMAP	MACRO II	JOVIAL
PROGRAMMING ANALYSTS	3	76	63	11	6	3	2	3
ASSISTANT PROGRAMMING NCOICs	8	75	58	4	8	0	0	8
PROGRAMMER-OPERATORS (COBOL III)	0	75	65	0	30	5	0	10
GENERAL PROGRAMMERS (COBOL I)	0	68	70	5	11	3	0	4
PROGRAMMERS (COBOL II)	1	64	68	7	12	1	0	3
GENERAL SYSTEMS PROGRAMMERS	0	56	20	22	20	2	10	4
ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs	8	50	8	42	8	8	0	33
PROGRAM TROUBLESHOOTERS	4	48	16	28	12	12	12	0
SYSTEMS TESTING PROGRAMMERS	0	42	25	50	8	8	0	8
ASSEMBLER PROGRAMMERS	0	40	7	73	7	7	13	7

TABLE 13

JOB GROUP AND DAFSC DISTRIBUTION OF 511X1 RESPONDENTS
(NUMBER OF PEOPLE RESPONDING)

JOB GROUP	DAFSC 51131	51151	51171
COMPUTER PROGRAMMERS			
COBOL PROGRAMMERS II	15	74	68
COBOL PROGRAMMERS I	10	125	97
COBOL PROGRAMMERS III	3	8	7
GENERAL SYSTEMS PROGRAMMERS	3	23	19
PROGRAMMING ANALYSTS	1	35	52
PROGRAM TROUBLESHOOTERS	1	12	8
ASSEMBLER PROGRAMMERS	0	6	4
SYSTEM TESTING PROGRAMMERS	0	1	6
ASSISTANT PROGRAMMING NCOICs (GRP308)	0	1	15
ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs (GRP598)	0	0	11
COMPUTER SYSTEMS MONITORS	3	26	21
DATA BASE ADMINISTRATORS	2	8	4
TRAINING PERSONNEL	0	3	13
SYSTEMS ANALYSIS AND DESIGN PERSONNEL	0	2	9
ADP SYSTEMS ACQUISITION PERSONNEL	0	1	3
511X0 JOB GROUPS	2	15	33
NOT GROUPED	7	47	60
TOTAL	47	387	430

TABLE 14

TASKS COMMON TO ALL 511X1 SKILL LEVEL GROUPS
(30 PERCENT MEMBERS RESPONDING OR MORE)

TASKS	DAFSC 51131 (N=45)	DAFSC 51151 (N=407)	DAFSC 51171 (N=462)
DEBUG COMPUTER PROGRAMS	89	83	80
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	84	74	67
DESK CHECK PROGRAMS	76	74	72
COMPILE OR ASSEMBLE PROGRAMS	73	77	72
TEST COMPUTER PROGRAMS	67	80	77
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	64	71	67
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	58	72	66
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	56	57	59
CODE JOB CONTROL LANGUAGE	51	55	57
PREPARE DETAILED FLOW CHARTS	42	53	41
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	33	32	32
REVIEW PROGRAM SPECIFICATIONS	31	43	50
INPUT, UPDATE, OR RETRIEVE DATA BY USING REMOTE INQUIRY UNITS	53	68	63

TABLE 15

TASKS MOST CLEARLY DISTINGUISHING 51131 AND 51151 PERSONNEL
(30 PERCENT MEMBERS RESPONDING OR MORE)

TASKS	DAFSC 51131 (N=45)	DAFSC 51151 (N=407)	DIFFERENCE
PREPARE OR REVISE PROGRAM OPERATIONS MANUALS	9	35	-26
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	31	56	-25
PREPARE OR REVISE PROGRAM SPECIFICATIONS	4	28	-24
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	29	52	-23
ESTIMATE PROGRAMMING OR SYSTEM REQUIREMENTS	7	30	-23
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	11	34	-23
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	33	55	-22
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	24	44	-20

* 29 TASKS PERFORMED BY 30 PERCENT OR MORE DAFSC 51131 PERSONNEL
* 57 TASKS PERFORMED BY 30 PERCENT OR MORE DAFSC 51151 PERSONNEL

TABLE 16

TASKS MOST CLEARLY DISTINGUISHING 51151 AND 51171 PERSONNEL
(PERCENT MEMBERS PERFORMING)

TASKS	DAFSC 51151 (N=407)	DAFSC 51171 (N=462)	DIFFERENCE
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	55	43	+12
CONVERSE OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	59	48	+11
PUNCH CARDS	74	65	+ 9
REPRODUCE CARDS	33	24	+ 9
* * * * * * *			
COUNSEL PERSONNEL ON PERSONAL OR MILITARY MATTERS	17	39	-22
SUPERVISE PERSONNEL PERFORMING PROGRAMMING DUTIES	5	27	-22
INSPECT PERSONNEL FOR MILITARY APPEARANCE	10	31	-21
INSTRUCT OR TRAIN PERSONNEL IN TECHNICALITIES OF SYSTEM ANALYSIS	20	32	-12
ANALYZE DATA BASE REQUIREMENTS	22	32	-10
COORDINATE WITH OFFICES OF PRIMARY RESPONSIBILITY (OPR) ON NEW OR REVISED REPORTING REQUIREMENTS	21	31	-10
TEST PROGRAM AND SUB-SYSTEM INTERFACE	22	30	- 8

* 59 TASKS PERFORMED BY 30 PERCENT OR MORE DAFSC 51171 PERSONNEL

ANALYSIS OF AFR 39-1 SPECIALTY DESCRIPTIONS

The specialty descriptions in AFR 39-1, dated October 1978, were compared to the survey data. AFR 39-1 descriptions are intended to give a broad overview of the major duties and tasks performed at each skill level in a specialty. The 51131/51/71 specialty descriptions show a definite progression of technical skills as described in the ANALYSIS OF DAFSC GROUPS section of this report. However, some additions to the present 5- and 7-skill level descriptions could further clarify the duties and responsibilities of the 511X1 specialty. These additions are reflected in Appendix C.

ANALYSIS OF EXPERIENCE (AFMS) GROUPS

An analysis was also made comparing task and job differences among individuals grouped by Total Active Federal Military Service (TAFMS). The overall homogeneity found in the job structure and DAFSC analysis is apparent across the various enlistment groups. The job of each enlistment period revolves around programming, operations, and analysis responsibilities.

In looking at the jobs performed by first enlistment 511X1 personnel (1-48 months AFMS), a high degree of homogeneity was found. As seen on Table 17, 82 percent of the first-term respondents fell within the computer programming cluster, and six percent were computer systems monitors. The remaining 13 percent are spread among many groups or were not grouped in the job structure. Table 18 substantiates this homogeneity, indicating that 511X1 personnel with less than 48 months TAFMS spend a majority of their time on programming and operator functions. Tasks with the highest probability of performance by first-term respondents are listed on Table 19 and revolve around debugging, testing, compiling, assembling, and desk checking computer programs. In the performance of these tasks, 53 percent indicate using COBOL, 11 percent FORTRAN, and ten percent responded to using ASSEMBLER computer languages the most. As seen on Table 20, additional computer programs are utilized by 511X1 first termers, but to a much lesser degree. Interestingly, nine percent indicated they did not perform any programming. Peripheral equipment utilized by 30 percent or more of first term respondents include CRT terminals, line printers, magnetic tape units, IBM 59 card verifiers, and duplicating machines.

Throughout all enlistment periods, the performance of programming functions remains dominant. The only noticeable change between first-term respondents and respondents in subsequent enlistment periods is that more experienced respondents gradually assume limited supervisory duties. However, even in senior enlistment groups, supervisory duties never completely overtake the performance of programming tasks. The appearance of a significant amount of time spent in supervision does not occur until the 12 year (145 months AFMS) point. Even at the 20-year point, programming alone still occupies 27 percent of the respondents time versus 21 percent time spent in supervisory and management functions (see Table 18).

Job satisfaction information, when compared to combined data from other related specialties recently surveyed, can indicate the relative intentions or attitudes of specialty incumbents about such factors as job interest, perceived utilization of talents and training, and reenlistment intent. The comparative data sample, taken from all Direct Support specialties surveyed in 1979, include Weather (251X0), Maintenance Analysis-Aerospace Weapons Systems (391X0A) or Communications-Electronics (391X0B), Small Arms (753X0), and Security (811X0A) and Law Enforcement (811X2A).

Table 21 compares the responses of all 511X1 respondents and those of the comparative sample by enlistment group. Several trends may be noted in these responses. The overall job satisfaction data (job interest, and utilization of talent and training) are higher in a majority of 511X1 enlistment groups versus those of the comparative sample. The greatest disparity is in

the first-term respondents feelings of job interest where 81 percent of the programmers feel their job is interesting and only 42 percent of the comparative sample indicated that their job was interesting. Job interest and perceived utilization of talents for the 511X1 respondents indicated a steady decrease with time unlike the comparative smple which indicated a steady increase with time. A possible explanation for this trend is the fact that the overall job remains very technical in nature throughout most of the Programmers career. Very little advancement in the area of management or supervision is apparent, which could inhibit an increase in job interest among career personnel (a trend observed in most specialties). When considering reenlistment intentions, more of the comparative sample have a higher intent of reenlisting than 511X1 respondents. This is a distinct problem area within the programming specialty, probably due to the marketable skill programming provides in the civilian sector.

In general, the AFMS analysis reveals very few differences between groups with varying AFMS experience. Understanding the role of the first enlistment respondent is not only the basis for specialty progression, but can also provide an insight as to areas in which to best utilize training time and resources. There is a trend towards performing more supervisory tasks as time in service increases, but on the whole, the job remains essentially technical in nature.

TABLE 17

JOB GROUP DISTRIBUTION OF FIRST-TERM RESPONDENTS

JOB GROUP	PERCENT FIRST-TERM MEMBERS (N=231)
COMPUTER PROGRAMMERS CLUSTER	82
COMPUTER SYSTEMS MONITORS	6
COMPUTER OPERATIONS	3
DATA BASE ADMINISTRATORS	2
ADP EQUIPMENT MANAGERS	*
SYSTEMS ANALYSIS AND DESIGN PERSONNEL	*
TRAINING PERSONNEL	*
ADP SYSTEMS ACQUISITION PERSONNEL	*
NOT GROUPED	7
	100%

*INDICATES LESS THAN ONE PERCENT

TABLE 18

RELATIVE PERCENT TIME SPENT ON DUTIES BY AFMS GROUPS

DUTIES	AFMS GROUPS 1-48 MONTHS (N=231)	49-96 MONTHS (N=235)	97-144 MONTHS (N=146)	145-192 MONTHS (N=127)	193-240 MONTHS (N=143)	241+ MONTHS (N=32)
PROGRAMMING FUNCTIONS	35	33	32	31	27	27
OPERATOR FUNCTIONS	24	23	22	18	19	12
ANALYSIS FUNCTIONS	14	14	16	16	19	14
PRODUCTION CONTROL FUNCTIONS	13	13	11	10	9	8
SECURITY FUNCTIONS	4	5	4	5	4	9
GENERAL MILITARY FUNCTIONS	3	2	2	2	2	1
SUPERVISORY FUNCTIONS	2	3	5	8	10	16
TRAINING FUNCTIONS	2	3	4	5	5	5
ADMINISTRATIVE FUNCTIONS	1	2	2	3	3	6
LIBRARY FUNCTIONS	1	1	1	1	1	1
SUPPLY OR CONTRACTING FUNCTIONS	1	1	1	1	1	1

TABLE 19

REPRESENTATIVE TASKS PERFORMED BY FIRST-TERM 511X1 RESPONDENTS

TASK	PERCENT MEMBERS RESPONDING (N=231)
DEBUG COMPUTER PROGRAMS	89
TEST COMPUTER PROGRAMS	83
COMPILE OR ASSEMBLE PROGRAMS	82
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	82
DESK CHECK PROGRAMS	79
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	77
PUNCH CARDS	76
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	74
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	71
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	63
CODE JOB CONTROL LANGUAGES	61
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	61
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	59
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	58
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	57
PREPARE DETAILED FLOW CHARTS	55
LOAD PROGRAMS OR DATA FROM TAPES	54
LOAD PROGRAMS OR DATA FROM CARDS	53
INITIATE BATCHED JOB PROCESSING	51
LOAD PROGRAMS OR DATA FROM DISKS	50
* * * * * * *	
REMOVE PRINTED DATA OUTPUT	32
POWER UP OR POWER DOWN PERIPHERAL EQUIPMENT	32
REVIEW CONSOLE OUTPUT FOR JOB STATUS	31
PREPARE OR REVISE PROGRAM SPECIFICATIONS	31
DEVELOP PROGRAMMING AIDS, SUCH AS QUICK REFERENCE TABLES	31
ESTIMATE PROGRAMMING OR SYSTEMS REQUIREMENTS	30

62 TASKS PERFORMED BY 30 PERCENT OR MORE 511X1 FIRST-TERM PERSONNEL

TABLE 20

MOST COMMON PROGRAMMING LANGUAGES UTILIZED BY
511X1 FIRST ENLISTMENT PERSONNEL
(PERCENT MEMBERS SELECTING)

	PROGRAM USED MOST	PROGRAMS USED
DO NOT PERFORMING PROGRAMMING	9	9
COBOL	53	73
FORTRAN	11	37
ASSEMBLER	10	25
ALGOL	5	7
GMAP	4	11
JOVIAL	4	5
MACRO II	2	4
BASIC		14
PLI		5
BAL		3
RPG		3
ASM		2

TABLE 21

JOB SATISFACTION INDICES FOR TAFMS GROUPS
(PERCENT MEMBERS RESPONDING)

	1-48 MONTHS		49-96 MONTHS		97+ MONTHS	
	511X1 (N=231)	COMP SAMPLE* (N=3398)	511X1 (N=235)	COMP SAMPLE* (N=1654)	511X1 (N=448)	COMP SAMPLE* (N=2089)
I FIND MY JOB:						
NO RESPONSE	4	3	3	4	4	4
DULL	9	35	8	26	11	14
SO-SO	6	20	12	17	13	12
INTERESTING	81	42	77	53	72	70
MY JOB UTILIZES MY TALENTS:						
NO RESPONSE	0	2	2	1	1	2
NOT AT ALL OR VERY LITTLE	19	50	20	38	25	20
FAIRLY WELL TO VERY WELL	67	43	65	54	58	60
EXCELLENTLY OR PERFECTLY	14	5	13	7	16	18
MY JOB UTILIZES MY TRAINING:						
NO RESPONSE	1	1	1	1	1	2
NOT AT ALL OR VERY LITTLE	25	30	32	32	34	24
FAIRLY WELL TO VERY WELL	60	61	55	58	48	58
EXCELLENTLY OR PERFECTLY	14	8	12	9	17	16
I PLAN TO REENLIST:						
NO RESPONSE	0	4	1	4	1	3
NO OR PROBABLY NO	75	64	56	45	38	30
YES OR PROBABLY YES	25	32	43	51	61	67

* COMPARATIVE SAMPLE TAKEN FROM ALL DIRECT SUPPORT SPECIALTIES SURVEYED IN 1979, INCLUDES AFSCs 25XXX, 39XXX, 75XXX, AND 81XXX

ANALYSIS OF CONUS VERSUS OVERSEAS GROUPS

A comparison was made of the various tasks performed and background data for DAFSC 51151 respondents assigned within the CONUS versus those assigned to overseas locations. Very few differences could be detected in the overall mission of computer programmers in regard to their CONUS/OS location. Overseas personnel did tend to perform more average tasks (69 versus 55 for CONUS personnel) but the job difficulty index is 11.5 for both groups. As can be seen on Table 22, the greatest task differences occur in the greater performance of tasks such as revising operating instructions or reporting requirements, programming keypunch machines, and isolating problems on production runs, by overseas personnel. This does not necessarily reflect a significant difference, only that possibly due to a lack of civilian support and/or resources, overseas personnel have slightly more task responsibilities.

As is to be expected, many types of organziations (i.e., Research/ Development-Data Systems Design Center, Data Systems Center and Separate Operating Agencies) are not at overseas locations. This also explains the differences in computer languages utilized. While all personnel indicated using COBOL and FORTRAN the most, CONUS personnel indicated using a wider variety of languages (see Table 23). Small percentages of overseas personnel did indicate GMAP or MACRO II languages. A difference does occur in the average time in the career field, with 5-skill level overseas personnel averaging 51 months and CONUS personnel only 29 months. This is not as apparent in average time active federal military service, where the average is 66 months and 60 months respectively. No significant differences could be found in a comparison of job satisfaction for CONUS and overseas personnel.

TABLE 22

TASKS WHICH BEST DIFFERENTIATE BETWEEN DAFSC 51151
CONUS AND OVERSEAS GROUPS
(PERCENT MEMBERS PERFORMING)

TASKS	CONUS (N=358)	OVERSEAS (N=45)	DIFFERENCE
REPRODUCE COPIES OF DOCUMENTS USING OFFICE COPY MACHINES	30	20	+10
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CRTs OR TELETYPES	69	60	+ 9
CHANGE OR ALIGN PAPER IN PRINTERS	31	22	+ 9
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA	60	51	+ 9
CHECK IN OR CHECK OUT MAGNETIC MEDIA FROM LIBRARY	33	24	+ 9
* * * * * * * * * *			
PREPARE JOB OR RUN SHEETS	39	60	-21
ISOLATE PROBLEMS ON PRODUCTION RUNS	28	49	-21
PROGRAM KEYPUNCH MACHINES	22	44	-22
COORDINATE WITH OPR ON NEW OR REVISED REPORTING REQUIREMENTS	19	42	-23
PREPARE OR REVISE COMPUTER OPERATOR INSTRUCTIONS	29	58	-29

TABLE 23

MOST COMMON COMPUTER LANGUAGES UTILIZED BY DAFSC 51151 CONUS
AND OVERSEAS GROUPS
(PERCENT MEMBERS UTILIZING)

PROGRAMMING LANGUAGES UTILIZED	CONUS (N=358)	OVERSEAS (N=45)
COBOL	66	76
FORTRAN	31	29
ASSEMBLER	23	13
BASIC	10	13
GMAP	9	13
JOVIAL	6	0
PLI	5	0
ALGOL	4	0
MACRO II	1	11
USE TDSP PROCEDURES	61	58
DO NOT PERFORM PROGRAMMING	12	13

SUMMARY OF BACKGROUND INFORMATION

Each USAF Job Inventory contains a background information section in which the respondent reports information about themselves and their job. When summarized, these variables can provide an insight into the relationship between jobs, skill level, experience level, or other AFSCs. This information summarized in the following paragraphs involves specifically the type of activity programmers may be assigned, the various programming languages used, and the use of Top Down Structured Programming procedures.

Type of Activity Assigned

A look at differences occurring among the responsibilities of programmers assigned to different types of organizational activities revealed some interesting and descriptive trends. Activities primarily utilizing programmers (AFS 511X1) center around Data Automation, Intelligence, Command and Control, support for Separate Operating Agencies, Research and Development, the Data Systems Design Center, and the Data Service Center (see Table 24). The mission of these various organizations influences the time spent and types of tasks respondents perform. As illustrated in the following summary paragraphs, each activity tends to spend a majority of their time in a different function or combination of functions. Table 25 shows differentiating tasks based on percent members performing. Although distinguishing tasks may characterize some groups (i.e., Intelligence), for the most part the tasks performed are comparable between groups. The main differences occur in the amount of time spent on the tasks and duties performed (see Table 26). The following paragraphs summarize distinguishing characteristics of the activities 511X1 personnel are primarily assigned to.

Data Automation. Having the most personnel assigned, this group is characterized by performing an average of 60 tasks, a job difficulty index of 14.1, and having 30 percent of the respondents in their first enlistment. These respondents indicated using the GMAP language in addition to COBOL. They also spend as much or more time (15 percent) than other activities on production control tasks, such as determining causes of faulty output; assemble, rearrange, or edit input/output; or batch run requests.

Data Systems Design Center. These respondents are distinguished by spending their time primarily in programming (40 percent), and also spending slightly more time in analysis functions than other groups. Tasks such as preparing system test data, revising program maintenance manuals, and coding computer programs in higher level languages are representative of these time spent differences.

Intelligence. These respondents are dominate across all tasks listed on Table 25, while other groups tend to distinguish themselves among a smaller number of tasks. These people also performed more average (85) tasks and have a more difficult job than any other activity. Spending less time (28 percent) in programming, these people did indicate more time spent in analysis (17 percent) functions than other groups, and use of the COBOL, GMAP, and BAL languages.

Command and Control. Utilizing the COBOL, ASSEMBLER, and ALC languages, this activity is distinguished by their lack of concentration in any area(s). This group also spends distinctly less time (seven percent) in production control functions.

Support Activity for Separate Operating Agencies. Use of the ALGOL computer language, and a high concentration of time spent (40 percent) on strictly programming tasks differentiate this group. Tasks such as compiling, assembling, or debugging computer programs, and testing computer programs are representative of those these people spend most of their time on. High job satisfaction responses are also characteristic of this group.

Research and Development. Operations tasks separated these people from other groups. Representative operations tasks like entering data into the computer, using remote inquiry units (i.e., CRTs or teletypes), and initiating batched job processing are performed more by this group. Also indicating the widest use of different languages, these people respond to using COBOL, ASSEMBLER, ALC, and GMAP languages.

Data Service Center. Using the BASIC computer language in addition to COBOL, having the highest reenlistment intentions, and spending more time (15 percent) in production control related tasks than other groups identifies these respondents. Tasks such as responding to inquiries from customers, preparing job or run sheets and optimizing job control languages (JCL) are representative distinguishing tasks these people concentrate more time on.

TABLE 24

TYPE OF ACTIVITIES ASSIGNED
(PERCENT MEMBERS RESPONDING)

ACTIVITY	PERCENT MEMBERS RESPONDING
DATA AUTOMATION	25
DATA SYSTEMS DESIGN CENTER	13
INTELLIGENCE	10
COMMAND AND CONTROL	9
SUPPORT ACTIVITY FOR SEPARATE OPERATING AGENCIES	7
RESEARCH AND DEVELOPMENT	6
DATA SERVICE CENTER	5
ADP RESOURCES MANAGEMENT	3
CARGO/PASSENGER PROCESSING	3
COMBAT EVALUATION	3
OPERATIONS/PLANS	3
STUDIES AND ANALYSIS	3
COMMUNICATIONS	2
REGIONAL COMPUTER CENTER	2
SATELLITE TRACKING	2
TRAINING	2
COMBAT OPERATIONS CENTER	1
COMPTROLLER	1

TABLE 25

TASKS BEST DIFFERENTIATING TYPE OF ACTIVITY ASSIGNED
(PERCENT MEMBERS RESPONDING)

TASK	COMMAND AND CONTROL	DATA AUTOMATION	DATA SERVICE CENTER	DATA SYSTEMS DESIGN CENTER	INTELLIGENCE	RESEARCH AND DEVELOPMENT	SEPARATE OPERATING AGENCY
PUNCH CARDS	(75)	(71)	(74)	(74)	(68)	48	(67)
CONVERT DATA FROM ONE MEDIA TO ANOTHER	(55)	(55)	43	(50)	(64)	46	47
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGE	55	(75)	(72)	(75)	(80)	(74)	(77)
RESPOND TO INQUIRIES FROM CUSTOMERS	27	52	(78)	30	(60)	31	(58)
CODE JOB CONTROL LANGUAGES	56	56	(74)	31	(71)	54	(61)
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	23	48	(61)	36	(62)	31	47
LOAD OR UNLOAD DISKS	14	9	13	7	(33)	(30)	6
LOAD PROGRAMS OR DATA FROM DISKS	39	37	30	37	(61)	39	(52)
PARTICIPATE WITH PROGRAMMERS IN DEBUGGING PROGRAMS	57	49	39	45	(67)	44	(58)
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	53	58	57	53	(81)	46	(63)
DETERMINE PROGRAM RUN TIMES	26	38	30	22	(53)	26	(53)
PREPARE OR REVISE COMPUTER OPERATOR INSTRUCTIONS	25	38	30	31	(65)	20	39
STORE OR SAFEGUARD CLASSIFIED MATERIAL	48	26	46	1	(64)	20	14

TABLE 26

PERCENT TIME SPENT ON PRIMARY FUNCTIONS BY ACTIVITY ASSIGNED

ACTIVITY ASSIGNED	FUNCTION			
	PROGRAMMING	OPERATIONS	ANALYSIS	PRODUCTION CONTROL
SUPPORT FOR SEPARATE OPERATING AGENCIES	40	21	16	11
DATA SYSTEMS DESIGN CENTER	40	21	18	11
INTELLIGENCE	28	19	17	11
DATA AUTOMATION	32	19	16	15
DATA SERVICE CENTER	30	23	11	15
RESEARCH AND DEVELOPMENT	32	28	13	8
COMMAND AND CONTROL	30	23	15	7

Computer Programming Languages Utilized

To aid in determining what computer programming languages are most relevant to 511X1 personnel, survey respondents were asked what language(s) they used, and what language they use the most. Table 27 illustrates the various languages responded to. COBOL is the only language distinctly performed the most in programming operations, with FORTRAN and ASSEMBLER also being used by higher percentages of respondents. Table 28 illustrates tasks distinguishing the COBOL language and the ASSEMBLER or FORTRAN languages. Programming tasks did not differentiate between the languages, but variances were found between the operations and production control tasks.

Fourteen percent of the 511X1 specialty responded to not performing any programming, but indicated they are involved in systems analysis, data base management, training, systems monitoring, or supervision. When comparing tasks performed, personnel not performing programming were distinguished primarily by their lack of performing programming tasks. They did not tend to perform any other tasks (i.e., managment, administration) substantially more than COBOL programmers (see Table 29).

TABLE 27

MOST COMMON COMPUTER LANGUAGES UTILIZED
(PERCENT MEMBERS SELECTING)

LANGUAGES	PROGRAM USED MOST	PROGRAMS USED
COBOL	50	63
FORTRAN	10	28
ASSEMBLER	10	21
JOVIAL	4	5
GMAP	3	10
ALGOL	2	3
MACRO II	2	3
PLI	1	4
BAL	1	3
BASIC	*	9
ALC	*	2
DUEL	*	2
RPG	*	2
ASM	*	1

DO NOT PERFORM PROGRAMMING - 14%

TABLE 28

TASKS BEST DISTINGUISHING BETWEEN COMPUTER LANGUAGE USED
(PERCENT MEMBERS RESPONDING)

TASKS	COBOL	FORTRAN	ASSEMBLER
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	47	27	33
COORDINATE WITH OFFICES OF OPR ON REPORT FORMATS	29	17	15
PREPARE INPUT OR OUTPUT FILE SPECIFICATIONS	40	38	27
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS	66	76	52
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	87	94	51
CHANGE OR ALIGN PAPER PRINTERS	26	52	38
POWER UP OR DOWN PERIPHERAL EQUIPMENT	18	43	28
CODE FOR GRAPHIC DISPLAY PLOTTERS	2	26	12
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	38	66	56
PERFORM RESTART PROCEDURES ON COMPUTER SYSTEM	7	31	36
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGE	19	34	92
MOUNT OR DISMOUNT MAGNETIC OR PAPER TAPES	7	39	43
INTERROGATE MEMORY LOCATION VIA CONSOLE ACTION	6	17	44
PERFORM SYSTEM INITIALIZATION PROCEDURES	7	29	43
CODE MACRO	5	13	39

TABLE 29

TASKS BEST DISTINGUISHING BETWEEN PERSONNEL INDICATING NO PROGRAMMING AND THOSE PROGRAMMING
(PERCENT OF EACH GROUP)

TASK	DO NOT PERFORM PROGRAMMING	PERFORMING* PROGRAMMING	DIFFERENCE
NOTIFY PROGRAMMERS OR ANALYSTS OF PROCESSING PROBLEMS	45	24	+21
NOTIFY CUSTOMERS OF PRODUCTION PROBLEMS	37	24	+13
DRAFT CORRESPONDENCE	28	17	+11
STORE OR SAFEGUARD CLASSIFIED MATERIAL	33	23	+10
NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	35	25	+10
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	15	78	-63
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	17	78	-61
DEBUG COMPUTER PROGRAMS	31	91	-60
DESK CHECK PROGRAMS	25	83	-58
COMPILE OR ASSEMBLE PROGRAMS	28	84	-56

* PERSONNEL INDICATING USE OF THE COBOL LANGUAGE

Use of Top Down Design and Structured Programming

Tasks distinguishing users of Top Down and Structured Programming (TDSP) versus nonusers are shown on Table 30. Users of TDSP were differentiated by programming tasks while nonusers of TDSP performed more of the operations-related tasks. The time spent overlap is very high, 89 percent, between these groups. Overall, the tasks performed and time spent on tasks by users or nonusers of TDSP is very similar. Within the 511X1 specialty, 54 percent of the personnel indicated using TDSP procedures.

Table 31 illustrates the use of TDSP within the 511X1 job structure groups. All job groups within the programming job structure indicated using TDSP to some degree. The most predominate use is by members of the COBOL job types within the Programming cluster and the Systems Design and Analysis independent job type. Interestingly, those groups not utilizing TDSP indicated performing less programming, as can be seen in the Training, Computer Systems Monitor, and Data Base Administrator job groups. Those personnel assigned to SAC (66 percent), AFSC (58 percent), and ATC (54 percent) indicated using TDSP most, while respondents from TAC (44 percent), USAFE (37 percent), and ADC (39 percent) did not. Users of TDSP have an average of less time in the career field (47 months) than nonusers (61 months). Those personnel using TDSP are concentrated in Data Automation, Intelligence, Research/Development, and Logistics areas of assignment.

TABLE 30

MOST DISTINGUISHING TASKS BETWEEN USERS AND NONUSERS OF TDSP

TASKS	USE TDSP	DO NOT USE TDSP	DIFFERENCE
DRAW HIPO SOLUTIONS TO PROBLEMS	33	4	+29
PREPARE DETAILED FLOW CHARTS	60	44	+16
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	87	72	+15
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	47	33	+14
CODE JOB PARAMETER STATEMENTS	34	22	+12
MOUNT OR DISMOUNT MAGNETIC OR PAPER TAPES	15	22	- 7
CODE SYSTEM UTILITY PROGRAMS	27	33	- 6
LOAD PROGRAMS OR DATA FROM TAPES	44	50	- 6
ANALYZE CONSOLE PRINTOUTS TO IDENTIFY COMPUTER STOPPAGES	22	28	- 6
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	44	49	- 5

TABLE 31

USE OF TOP DOWN DESIGN AND STRUCTURED PROGRAMMING
BY MAJOR PROGRAMMING JOB GROUPS
(PERCENT MEMBERS RESPONDING)

JOB GROUP	DO NOT PERFORM PROGRAMMING	DO USE TDSP	DO NOT USE TDSP
COMPUTER PROGRAMMING CLUSTER	2	65	33
PROGRAM ANALYSTS	1	76	23
ASSISTANT PROGRAMMING NCOICs	2	75	23
GENERAL COBOL PROGRAMMERS	0	75	25
COBOL PROGRAMMERS	1	68	31
COBOL PROGRAMMER-OPERATORS	1	64	35
GENERAL SYSTEMS PROGRAMMERS	6	56	38
ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs	17	50	33
PROGRAM TROUBLESHOOTERS	14	48	38
SYSTEMS TESTING	-	42	58
ASSEMBLER PROGRAMMERS	7	40	53
SYSTEMS ANALYSIS AND DESIGN PERSONNEL	31	62	7
DATA BASE ADMINISTRATORS	47	27	40
TRAINING PERSONNEL	50	37	13
COMPUTER SYSTEMS MONITORS	85	2	13

TRAINING ANALYSIS

Occupational survey data is just one of many sources of information which can be used to help make training programs more meaningful and relevant to students. Factors provided in occupational surveys which may be used in evaluating training are percent of first enlistment members performing tasks(s)*, utilization of equipment available at the Technical School for training, task dificulty ratings, and training emphasis ratings. An in-depth analysis of first enlistment (1-48 months AFMS) was previously discussed in the ANALYSIS OF EXPERIENCE (AFMS) GROUPS section. These factors were used in evaluating the Specialty Training Standard (STS) and Plan of Instruction (POI) for the 511X1 specialty. Technical school personnel at Keesler AFB MS matched inventory tasks to areas of instruction outlined in the STS, dated September 1978 and the POI for course 3ABR51131, dated February 1979, for the Programming specialty. A complete computer listing of the percent members performing, task difficulty, and training emphasis ratings for each task statement along with the STS and POI matching has been forwarded to the technical school for their use in reviewing training documents. A summary of that information is described in the following section.

Analysis of Task Difficulty

The relative difficulty of each task in the task inventory was assessed through ratings by 47 experienced 7- and 9-skill level programming NCOs. These ratings were processed to produce an ordered listing of all tasks in terms of their relative difficulty and were standardized to have an average difficulty of 5.0 (standard deviation equals 1.0). (For a more complete description of these ratings, see the Task Factor Administration section in the INTRODUCTION.)

Table 32 lists those tasks rated the most difficult by 511X1 personnel. Most of the tasks are troubleshooting in nature, and seem to involve some aspect of operations, programming, or analysis. For example, debugging computer programs and coding job control languages seem to be programming type tasks, while changing hardware systems configurations and isolating causes of machine stops or malfunctions are operations related. Overall, only four of the most difficult tasks are performed by more than 25 percent of the total 511X1 sample.

Table 33 provides a listing of the most difficult tasks performed by at least 30 percent of the 511X1 first enlistment and 511X1 total sample. As expected, these tasks are primarily programming related functions, especially in the area of coding or troubleshooting programs. Interestingly, most of these more difficult tasks are performed not only by the specialty as a whole, but also by comparable percentages of first enlistment personnel. On a whole, the more difficult tasks are not only performed by experienced 511X1 personnel, but also by the more inexperienced respondent.

*First enlistment data is probably more valid for use in making training decisions involving initial training than 3-skill level data since 3-skill level personnel are very quickly entered into upgrade training and many will be given a 5-level duty AFSC. Thus, at any point in time, the number of 3-skill level personnel is small and the jobs they perform may not be completely representative of tasks new personnel need to be trained to perform.

Most of the tasks rated average in ask difficulty (see Table 34) also revolved around programming functions, but of a more general nature dealing with the various documentation of programs or formats. Tasks rated average in task difficulty but not performed by a substantial percent (30 percent) of the specialty focused on supervisory duties. These tasks include reviewing job descriptions, directing use of supplies, or conducting or participating in staff meetings. Again, as with the most difficult tasks, the technical tasks rated average in difficulty are performed not only by senior personnel, but also by the junior personnel within the specialty.

Table 35 lists tasks rated least difficult performed by 511X1 personnel. Generally, these tasks relate to computer oprations or production control. Overall, these tasks are not performed by as many personnel performing average or above average difficulty of tasks.

Analysis of Training Emphasis

The relative training emphasis of each task in the inventory was assessed through ratings of 50 experienced 7- and 9-skill level Programming NCOs. These ratings were processed to produce an ordered listing of all tasks in terms of their recommended emphasis in training of first enlistment personnel. These ratings had an average rating of 1.0 and a standard deviation of 1.0. (For a more complete description of these ratings, see the section on Task Factor Administration in the INTRODUCTION.)

The tasks rated highest in training emphasis for 511X1 first enlistment (first-term) personnel are shown on Table 36. The top tasks are exclusively programming tasks and are all performed by a substantial percentage of first-term respondents. Tasks such as debug computer programs and coding in ASSEMBLER, job control, and higher level languages also have above average task difficulty ratings. All tasks on Table 36 not only are rated high in training emphasis, but also have average or above average task difficulty ratings, which is indicative of the time required to learn each task.

Table 37 illustrates those tasks rated lowest in training emphasis that are performed by 30 percent or more of the first-term respondents. Many of these tasks are also annotated as having low difficulty ratings. These tasks are indicated to be rather simple to learn and not performed by many personnel, giving little justification to teaching these tasks in any resident technical training course unless they are taught in conjunction with more relevant tasks or procedures.

In using this data, training managers should consider the training emphasis and task difficulty ratings as additional guidelines to assist them in determining what should be covered in their specific course of instruction. Tasks which are more difficult to learn require more training time than tasks which are rated as less difficult. Those tasks with higher training emphasis ratings should probably be considered for initial ABR training, unless other factors (i.e., low percent members performing, low task difficulty, or course/field resources) indicated a rationale for alternate training, such as formal OJT, FTD, or MTT. In the following paragraphs these factors have been used to evaluate the current STS and POI for the 511X1 specialty. Recommendations and comments can only be made on the basis of these factors and

should be considered in that light. Hopefully, these analyses will serve as indicators or guidelines for overall improvements or validation of the current training documents.

Specialty Training Standard

A comprehensive review of the 511X1 STS, dated September 1978, was made comparing STS items to survey data. STS paragraphs containing general information (paragraph 1) or having only subject matter knowledge (paragraph 4) were not evaluated. All major inventory tasks performed by specialty incumbents are reflected in the STS.

The performance of several operations-related tasks by programmers suggests the need to include a separate paragraph in the STS concerning computer operation. Table 38 illustrates those operations-related tasks most often performed by programmers. It may also by noted many of these tasks are rated average or above average in training emphasis by 511X1 senior NCOs.

Overall, the STS is very comprehensive and describes the various programming functions of AFS 511X1 personnel.

Plan of Instruction

The 3ABR51131 course consists of 55 days of training designed to give the student theory and practical application of programming procedures and related skills. Familiarization with the COBOL, FORTRAN, and ASSEMBLER programming languages also represents those most commonly utilized by AFS 511X1 respondents. Ancillary equipment items utilized by the technical training center reflects those most commonly responded to as used out in the field (see Table 39). The use of CRTs and teletypes in Block II of the POI indicates an orientation with the operations-related portion of computer systems. On the basis of this evaluation, it can be said that, overall items currently taught in the 3ABR51131 course are relevant to the specialty.

TABLE 32

TASKS RATED HIGHEST IN TASK DIFFICULTY

TASKS	T. D.	PERCENT MEMBERS PERFORMING (N=914)
CODE COMPUTER PROGRAMS IN MACHINE LANGUAGES	7.9	9
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	7.2	32
TRANSLATE OR CONVERT PROGRAMS WRITTEN IN ONE COMPUTER LANGUAGE TO A DIFFERENT COMPUTER LANGUAGE	7.2	17
TEST OR DEBUG COMPILERS OR ASSEMBLERS	7.1	8
DESIGN REMOTE TERMINAL NETWORKS	7.0	3
ANALYZE OR READ INTERCOMMUNICATIONS (INTERCOM) SNAP DUMPS OR ABENDS	7.0	10
PREPARE HARDWARE SYSTEM CONVERSION PLANS	7.0	2
INSTRUCT OR TRAIN PERSONNEL IN TECHNIQUES OF SYSTEMS ANALYSIS	6.9	10
CODE FOR GRAPHIC DISPLAY PLOTTERS	6.8	7
DEBUG COMPUTER PROGRAMS	6.8	82
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	6.8	71
DESIGN APPLICATIONS DATA BASE	6.8	22
ISOLATE CAUSES OF MACHINE STOPS OR MALFUNCTIONS	6.8	15
DESIGN AUDIT TRAILS	6.7	9
INSTRUCT OR TRAIN PERSONNEL IN PROGRAMMING TECHNIQUES	6.6	26
CHANGE HARDWARE SYSTEMS CONFIGURATIONS	6.6	6
CODE MACRO	6.6	13
PREPARE RECOMMENDATIONS FOR SIZE AND CAPACITY OF PROPOSED ADP EQUIPMENT	6.6	3
SUPERVISE SYSTEMS ANALYSIS AND DESIGN TEAMS	6.5	2
CODE JOB CONTROL LANGUAGES	6.5	56

TABLE 33

MOST DIFFICULT TASKS PERFORMED BY 511X1 PERSONNEL
(30 PERCENT OR MORE PERFORMING)

TASK	T. D.	PERCENT MEMBERS PERFORMING 511X1	1ST ENL
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGE	7.2	32	36
DEBUG COMPUTER PROGRAMS	6.8	82	89
CODE COMPUTER LANGUAGES IN HIGHER LEVEL LANGUAGES	6.8	71	82
CODE JOB CONTROL LANGUAGES	6.5	56	61
ESTIMATE PROGRAMMING OR SYSTEMS REQUIREMENTS	6.5	31	30
OPTIMIZE JOB CONTROL LANGUAGE	6.4	32	40
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	6.4	58	63
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	6.3	69	77
DESIGN ERROR HANDLING ROUTINES	6.3	37	44
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	6.2	45	48
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	6.1	40	37
DETERMINE SYSTEMS INPUT OR OUTPUT REQUIREMENTS	6.1	30	28

TABLE 34

TASKS RATED AVERAGE IN DIFFICULTY PERFORMED BY 511X1 PERSONNEL

TASK	T. D.	PERCENT MEMBERS PERFORMING 511X1	1ST ENL
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	5.9	51	61
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	5.9	49	58
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	5.8	69	74
PREPARE DETAILED FLOW CHARTS	5.8	47	55
REVIEW PROGRAM SPECIFICATIONS	5.7	46	46
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	5.6	36	32
DESIGN INPUT OR OUTPUT FORMATS, SUCH AS CARD, PRINTED, OR MICROFORM REPORT FORMS	5.6	38	42
REVIEW PROGRAM REQUIREMENTS	5.6	45	47
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CRTs OR TELETYPES	5.5	65	71
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	5.4	44	47
DESK CHECK PROGRAMS	5.4	73	79
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	5.3	42	44
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	5.3	48	59
COMPILE OR ASSEMBLE PROGRAMS	5.2	74	82

TABLE 35

LEAST DIFFICULT TASKS PERFORMED BY 511X1 PERSONNEL
(30 PERCENT OR MORE PERFORMING)

	TASK	T. D.	PERCENT MEMBERS PERFORMING 511X1	1ST ENL
	RESPOND TO INQUIRIES FROM CUSTOMERS	4.9	45	44
	CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA	4.6	52	57
*	BATCH RUN REQUESTS	4.5	31	37
	ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	4.4	36	42
	INITIATE BATCHED JOB PROCESSING	4.3	48	51
*	PREPARE JOB OR RUN SHEETS	4.2	42	44
*	INTERPRET OR VERIFY CARDS VISUALLY	4.2	31	33
	LOAD PROGRAMS OR DATA FROM DISKS	4.1	41	50
	LOAD PROGRAMS OR DATA FROM TAPES	3.9	45	54
	LOAD PROGRAMS OR DATA FROM CARDS	3.6	45	54
	PUNCH CARDS	3.5	69	76
*	NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	3.4	31	37
*	REPRODUCE COPIES OF DOCUMENTS USING OFFICE COPY MACHINES	2.7	33	34
*	REMOVE PRINTED DATA OUTPUT	2.6	31	32
*	CHANGE OR ALIGN PAPER IN PRINTERS	2.5	30	34

* ALSO RECEIVED LOW TRAINING EMPHASIS RATINGS

TABLE 36

TASKS RATED HIGHEST IN TRAINING EMPHASIS

TASK	T. E.	PERCENT FIRST-TERMERS RESPONDING
DEBUG COMPUTER PROGRAMS	7.2	89
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	7.1	82
CODE JOB CONTROL LANGUAGES	6.0	61
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	6.0	36
TEST COMPUTER PROGRAMS	5.9	83
DESK CHECK PROGRAMS	5.9	79
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	5.8	74
COMPILE OR ASSEMBLE PROGRAMS	5.6	82
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	5.2	77
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	5.2	63
PREPARE DETAILED FLOW CHARTS	4.6	55
COMPARE COMPILATION OR ASSEMBLY LISTINGS TO STANDARDS OR SPECIFICATIONS	3.9	33
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CRTs OR TELETYPES	3.8	71
DESIGN ERROR HANDLING ROUTINES	3.7	44
PREPARE SYSTEM FLOW CHARTS	3.7	34

* *OVERALL 68 TASKS WERE RATED HIGH (2.0 OR GREATER) IN TRAINING* EMPHASIS

TABLE 37

TASKS RATED LOWEST IN TRAINING EMPHASIS
(30 PERCENT OR MORE OF THE FIRST ENLISTMENT
RESPONDENTS PERFORMING)

	TASK	T. E.	PERCENT FIRST-TERMERS RESPONDING
	ESTIMATE PROGRAMMING OR SYSTEMS REQUIRMENTS	1.9	30
	NOTIFY PROGRAMMERS OR ANALYSTS OF PROCESSING PROBLEMS	1.8	36
	ANALYZE OUTPUT PRODUCTS FOR COMPLIANCE WITH STANDARDS OR SPECIFCATIONS	1.7	37
	REVIEW CONSOLE OUTPUT FOR JOB STATUS	1.7	31
	NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	1.6	37
	DETERMINE ALTERNATE METHODS FOR ACCOMPLISHING JOB REQUIREMENTS	1.6	35
*	PREPARE JOB OR RUN SHEETS	1.6	44
*	BATCH RUN REQUESTS	1.5	37
	RESOLVE PRODUCTION PROBLEMS WITH CUSTOMERS	1.4	35
*	INTERPRET OR VERIFY CARDS VISUALLY	1.2	33
	CHECK IN OR CHECK OUT MAGNETIC MEDIA FROM LIBRARY	1.0	34
	POWER UP OR POWER DOWN PERIPHERAL EQUIPMENT	.9	32
*	CHANGE OR ALIGN PAPER IN PRINTERS	.8	34
*	REMOVE PRINTED DATA OUTPUT	.8	33
*	REPRODUCE CARDS	.5	35
	CLEAN BARRACKS OR WORK FACILITIES	.4	34
*	REPRODUCE COPIES OF DOCUMENTS USING OFFICE COPY MACHINES	.3	34

AVERAGE T. E. RATING - 1.0
STANDARD DEVIATION - 1.0

* ALSO RECEIVED LOW TASK DIFFICULTY RATINGS

TABLE 38

OPERATIONS-RELATED TASKS PERFORMED BY AFS 511X1 PERSONNEL
(30 PERCENT OR MORE PERFORMING)

TASKS	PERCENT MEMBERS PERFORMING	T.E.*	T.D.**
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CRTs OR TELETYPES	65	3.8	5.5
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	36	3.0	4.6
LOAD PROGRAMS OR DATA FROM DISKS	41	2.5	4.1
INITIATE BATCHED JOB PROCESSING	48	2.5	4.3
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	44	2.5	5.4
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA	52	2.4	4.6
PUNCH CARDS	69	2.2	3.5
LOAD PROGRAMS OR DATA FROM CARDS	45	2.2	3.6
LOAD PROGRAMS OR DATA FROM TAPES	45	2.1	3.9
NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	31	1.6	3.4
REMOVE PRINTED DATA OUTPUT	31	1.0	2.6

* ABOVE AVERAGE T.E. RATING = 2.0
** AVERAGE T.D. RATING = 5.0

TABLE 39

MOST COMMON TYPES OF PERIPHERAL EQUIPMENT UTILIZED BY 511X1 FIRST ENLISTMENT PERSONNEL

PERIPHERAL EQUIPMENT	PERCENT OF FIRST ENLISTMENT PERSONNEL UTILIZING (N=231)
* CATHODE-RAY TUBE (CRT) TERMINAL	61
LINE PRINTER	45
* IBM 59 CARD VERIFIER	40
DUPLICATING MACHINE	37
MAGNETIC TAPE UNIT	36
DISK DRIVE UNIT	27
* TELETYPE MACHINE/TERMINAL	26
IBM 129 KEYPUNCH	26
ON-LINE CARD READER/PUNCH	21
MICROFILM/MICROFICHE READER	20
OFF-LINE PRINTER	17
ADDING/CALCULATING MACHINE	16
SYSTEM CONSOLE	14
IBM 26 PRINTING CARD PUNCH	12
ON-LINE CARD READER/PUNCH	12
COMPUTER OUTPUT MICROFILM/MICROFICHE (COM) SYSTEM	10

* AVAILABLE AT TECHNICAL SCHOOL FOR TRAINING

IMPLICATIONS

The data analysis for 511X1 respondents indicates no major problems in a specialty which has remained relatively stable over previous years. The current classification of these respondents is substantiated in the survey data, validating several classification changes occurring in 1978. Some revisions recommended based on the survey results may add to the clarity of the AFR 39-1 description.

A common core of tasks is performed by all 511X1 personnel indicating a homogeneous specialty. Programming specialty incumbents perform a technically-orientated job throughout their career until the 51199 skill level or 12 years AFMS. The tasks performed focus on programming and analysis functions, with an emphasis also occurring in operations. This overlap in operations is especially apparent in the Programming cluster job types. A programmer overlap also occurs in two "operator-dominated" independent job types (ADP Systems Acquisition Personnel and Systems Monitors).

APPENDIX A

REPRESENTATIVE TASKS PERFORMED BY JOB GROUPS

I. REPRESENTATIVE TASKS COMPUTER PROGRAMMING CLUSTER (GRP134)

TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	97
TEST COMPUTER PROGRAMS	94
COMPILE OR ASSEMBLE PROGRAMS	90
DESK CHECK PROGRAMS	88
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	87
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	85
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	85
PUNCH CARDS	72
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	72
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS, CATHODE-RAY TUBES (CRT) OR TELETYPES	71
CODE JOB CONTROL LANGUAGES	63
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	60
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	59
PREPARE DETAILED FLOW CHARTS	58
REVIEW PROGRAM SPECIFICATIONS	57
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	57
REVIEW PROGRAM REQUIREMENTS	56
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	52
INITIATE BATCHED JOB PROCESSING	52
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	51
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	51
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	49
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	49
LOAD PROGRAMS OR DATA FROM TAPES	49
RESPOND TO INQUIRIES FROM CUSTOMERS	48

Ia. COBOL PROGRAMMERS I
(GENERAL PROGRAMMERS)
(GRP537)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	97
TEST COMPUTER PROGRAMS	97
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	96
COMPILE OR ASSEMBLE PROGRAMS	95
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	94
DESK CHECK PROGRAMS	91
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	91
PUNCH CARDS	80
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	78
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	78
CODE JOB CONTROL LANGUAGES	77
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	72
PREPARE DETAILED FLOW CHARTS	66
DESIGN INPUT OR OUTPUT FORMATS, SUCH AS CARD, PRINTED, OR MICROFORM REPORT FORMATS	63
REVIEW PROGRAM SPECIFICATIONS	63
REVIEW PROGRAM REQUIREMENTS	62
DESIGN ERROR HANDLING ROUTINES	61
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	61
INITIATE BATCHED JOB PROCESSING	60
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	59
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	59
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	58
RESPOND TO INQUIRIES FROM CUSTOMERS	57
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	56
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	55

Ib. COBOL PROGRAMMERS II
(PROGRAMMERS)
(GRP313)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	99
TEST COMPUTER PROGRAMS	94
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	88
DESK CHECK PROGRAMS	88
COMPILE OR ASSEMBLE PROGRAMS	82
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	80
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	80
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	64
PUNCH CARDS	61
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	56
CODE JOB CONTROL LANGUAGES	54
PREPARE DETAILED FLOW CHARTS	49
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	46
REVIEW PROGRAM SPECIFICATIONS	37
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	34
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	33
REVIEW PROGRAM REQUIREMENTS	33
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	32
CONVERT OR RECORD DATA FROM ON MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	30
PREPARE JOB OR RUN SHEETS	29
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	29
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	27
INITIATE BATCHED JOB PROCESSING	27
ANALYZE OUTPUT PRODUCTS FOR COMPLIANCE WITH STANDARDS OR SPECIFICATIONS	27
PREPARE OR REVISE PROGRAM OPERATIONS MANUALS	27

Ic. COBOL PROGRAMMERS III
(PROGRAMMER-OPERATORS)
(GRP476)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	95
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	85
COMPILE OR ASSEMBLE PROGRAMS	85
INITIATE BATCHED JOB PROCESSING	85
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	85
ADDRESS OR CALL SYSTEM VIA CONSOLE ACTION TO REPOND TO SYSTEM REQUESTS	80
DEBUG COMPUTER PROGRAMS	75
TEST COMPUTER PROGRAMS	75
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	70
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	70
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	65
BATCH RUN REQUESTS	65
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	60
LOAD PROGRAMS OR DATA FROM TAPES	60
DESK CHECK PROGRAMS	55
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	55
KEY IN DATA TO TAPE OR DISK	50
LOAD PROGRAMS OR DATA FROM DISKS	50
PREPARE DETAILED FLOW CHARTS	50
PUNCH CARDS	50
CODE JOB CONTROL LANGUAGES	50
LOAD PROGRAMS OR DATA FROM CARDS	45
ANALYZE OUTPUT PRODUCTS FOR COMPLIANCE WITH STANDARDS OR SPECIFICATIONS	40
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	40
REPORT SECURITY VIOLATIONS	35

Id. ASSEMBLER PROGRAMMERS (GRP237)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	100
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	93
COMPILE OR ASSEMBLE PROGRAMS	93
LOAD PROGRAMS OR DATA FROM TAPES	93
TEST COMPUTER PROGRAMS	80
DESK CHECK PROGRAMS	80
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	80
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	80
ANALYZE CONSOLE PRINTOUTS TO IDENTIFY COMPUTER STOPPAGES	80
PUNCH CARDS	80
CHECK IN OR CHECK OUT MAGNETIC MEDIA FROM LIBRARY	80
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	73
MAKE ENTRIES IN ADP EQUIPMENT DAILY UTILIZATION LOGS	73
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	73
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	67
LOAD PROGRAMS OR DATA FROM CARDS	67
NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	67
CODE MACRO	60
MOUNT OR DISMOUNT MAGNETIC OR PAPER TAPES	60
INTERROGATE MEMORY LOCATION VIA CONSOLE ACTION	60
PREPARE DETAILED FLOW CHARTS	60
PREPARE JOB OR RUN SHEETS	60
ADDRESS OR CALL SYSTEM VIA CONSOLE ACTION TO RESPOND TO SYSTEM REQUESTS	60
INTERPRET INDICATING OR REGISTER LIGHTS ON CENTRAL PROCESSING UNITS (CPU)	60
DESIGNATE CLASSIFIED MATERIAL FOR DESTRUCTION	60

Ie. GENERAL SYSTEMS PROGRAMMERS (GRP535)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
TEST COMPUTER PROGRAMS	100
DEBUG COMPUTER PROGRAMS	98
COMPILE OR ASSEMBLE PROGRAMS	98
DESK CHECK PROGRAMS	92
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	92
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	90
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	88
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	86
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	86
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	86
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	84
LOAD PROGRAMS OR DATA FROM DISKS	82
RESPOND TO OR CORRECT ERRORS VIA CONSOLE OPERATION	82
ADDRESS OR CALL SYSTEM VIA CONSOLE ACTION TO RESPOND TO SYSTEM REQUESTS	82
REMOVE PRINTED DATA OUTPUT	80
REVIEW CONSOLE OUTPUT FOR JOB STATUS	78
LOAD PROGRAMS OR DATA FROM TAPES	78
LOAD OR UNLOAD DISKS	78
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	76
LOAD PROGRAMS OR DATA FROM CARDS	76
PERFORM RESTART PROCEDURES ON COMPUTER SYSTEM	74
PUNCH CARDS	74
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	72
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	72
PERFORM SYSTEM INITIALIZATION PROCEDURES	72

If. PROGRAMMING ANALYSTS
(GRP930)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	100
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	99
TEST COMPUTER PROGRAMS	99
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	98
DESK CHECK PROGRAMS	97
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	95
COMPILE OR ASSEMBLE PROGRAMS	95
PREPARE OR REVISE PROGRAM SPECIFICATIONS	95
ESTIMATE PROGRAMMING OR SYSTEMS REQUIREMENTS	95
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	94
REVIEW PROGRAM SPECIFICATIONS	94
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	93
DESIGN ERROR HANDLING ROUTINES	93
REVIEW PROGRAM REQUIREMENTS	93
PREPARE INPUT OR OUTPUT FILE SPECIFICATIONS	92
DETERMINE SYSTEMS INPUT OR OUTPUT REQUIREMENTS	89
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	89
DESIGN INPUT OR OUTPUT FORMATS, SUCH AS CARD, PRINTED, OR MICROFORM REPORT FORMATS	88
PREPARE OR REVISE PROGRAM OPERATIONS MANUALS	88
DEVELOP MODELS OR DUMMY DATA TO SIMULATE FUNCTIONAL REQUIREMENTS	87
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	86
ANALYZE DATA BASE REQUIREMENTS	85
PREPARE SYSTEM TEST DATA	84
DETERMINE PROGRAM RUN TIMES	82
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	82

Ig. SYSTEMS TESTING PROGRAMMERS (GRP427)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	100
DEBUG COMPUTER PROGRAMS	100
ANALYZE OR REVIEW SYSTEM TEST RESULTS	92
PREPARE OR REVISE PROGRAM OPERATIONS MANUALS	92
ANALYZE CONSOLE PRINTOUTS TO IDENTIFY COMPUTER STOPPAGES	92
TEST COMPUTER PROGRAMS	83
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	83
PREPARE OR REVISE PROGRAM SPECIFICATIONS	83
PREPARE SYSTEM TEST DATA	83
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	75
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	75
DESK CHECK PROGRAMS	75
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	75
REVIEW PROGRAM REQUIREMENTS	75
LOAD PROGRAMS OR DATA FROM TAPES	75
SPONSOR INCOMING PERSONNEL	75
REMOVE PRINTED DATA OUTPUT	75
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	67
COMPILE OR ASSEMBLE PROGRAMS	67
ESTIMATE PROGRAMMING OR SYSTEMS REQUIREMENTS	67
PREPARE OR REVISE COMPUTER OPERATOR INSTRUCTIONS	67
REVIEW PROGRAM OPERATION MANUALS	67
PREPARE SYSTEMS USER MANUALS	67
LOAD PROGRAMS OR DATA FROM CARDS	67
PUNCH CARDS	67

Ih. PROGRAM TROUBLESHOOTERS (GRP812)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	100
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	100
TEST COMPUTER PROGRAMS	100
ANALYZE CONSOLE PRINTOUTS TO IDENTIFY COMPUTER STOPPAGES	100
COMPILE OR ASSEMBLE PROGRAMS	96
ISOLATE CAUSES OF MACHINE STOPS OR MALFUNCTIONS	96
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	96
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	96
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	92
LOAD PROGRAMS OR DATA FROM TAPES	92
INTERROGATE MEMORY LOCATION VIA CONSOLE ACTION	92
REMOVE PRINTED DATA OUTPUT	92
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	92
PUNCH CARDS	92
CODE SYSTEM UTILITY PROGRAMS	88
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	88
REVIEW CONSOLE OUTPUT FOR JOB STATUS	88
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	88
PERFORM SYSTEM INITIALIZATION PROCEDURES	88
DESK CHECK PROGRAMS	88
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	88
LOAD PROGRAMS OR DATA FROM CARDS	88
REVIEW PROGRAM REQUIREMENTS	88
ADDRESS OR CALL SYSTEM VIA CONSOLE ACTION TO RESPOND TO SYSTEM REQUESTS	88
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	84

1i. ASSISTANT PROGRAMMING (CLASSIFIED) NCOICs (GRP598)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	100
DEBUG COMPUTER PROGRAMS	100
TEST COMPUTER PROGRAMS	100
DESK CHECK PROGRAMS	100
STORE OR SAFEGUARD CLASSIFIED MATERIAL	100
DEFINE TRAINING REQUIREMENTS	100
LOAD PROGRAMS OR DATA FROM TAPES	100
CODE COMPUTER PROGRAMS IN ASSEMBLY LANGUAGES	92
COMPILE OR ASSEMBLE PROGRAMS	92
PREPARE OR UPDATE INDIVIDUAL TRAINING RECORDS	92
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	92
INSPECT PERSONNEL FOR MILITARY APPEARANCE	92
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	92
COUNSEL PERSONNEL ON PERSONAL OR MILITARY MATTERS	92
SUPERVISE PERSONNEL HANDLING CLASSIFIED MATERIAL	92
REVIEW PROGRAM SPECIFICATIONS	92
DESIGNATE CLASSIFIED MATERIAL FOR DESTRUCTION	92
LOAD PROGRAMS OR DATA FROM CARDS	92
PUNCH CARDS	92
SUPERVISE PERSONNEL PERFORMING PROGRAMMING DUTIES	83
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	83
EVALUATE TRAINING METHODS, TECHNIQUES, OR PROGRAMS	83
ESTABLISH PERFORMANCE STANDARDS FOR SUBORDINATES	83
ANALYZE CONSOLE PRINTOUTS TO IDENTIFY COMPUTER STOPPAGES	83
REVIEW PROGRAM REQUIREMENTS	83

13. ASSISTANT PROGRAMMING NCOICs (GRP308)

REPRESENTATIVE TASKS	PERCENT MEMBERS PERFORMING
DEBUG COMPUTER PROGRAMS	96
TEST COMPUTER PROGRAMS	96
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	92
SUPERVISE PERSONNEL PERFORMING PROGRAMMING DUTIES	88
COMPILE OR ASSEMBLE PROGRAMS	88
DESK CHECK PROGRAMS	88
INSPECT PERSONNEL FOR MILITARY APPEARANCE	83
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	79
SCHEDULE LEAVE OR LIBERTY	79
SPONSOR INCOMING PERSONNEL	79
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	75
REVIEW PROGRAM SPECIFICATIONS	75
PREPARE DETAILED FLOW CHARTS	75
MAKE WORK ASSIGNMENTS	75
DIRECT OR IMPLEMENT OJT PROGRAMS	71
REVIEW PROGRAM REQUIREMENTS	71
PREPARE OR UPDATE INDIVIDUAL TRAINING RECORDS	71
COUNSEL PERSONNEL ON PERSONAL OR MILITARY MATTERS	71
INSTRUCT OR TRAIN PERSONNEL IN PROGRAMMING TECHNIQUES	67
DEFINE TRAINING REQUIREMENTS	67
CONDUCT OR PARTICIPATE IN STAFF MEETINGS	67
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	67
DIRECT SYSTEM ANALYSTS OR PROGRAMMING ACTIVITIES	63
WRITE OR RECOMMEND ENLISTED PERFORMANCE EVALUATIONS OR PRO AND CON MARKS	63
REVIEW PROGRAM MAINTENANCE MANUALS	63

REPRESENTATIVE TASKS
II. TRAINING PERSONNEL
(INDEPENDENT JOB TYPE)
(GRP170)

TASKS	PERCENT MEMBERS PERFORMING
CONSTRUCT TRAINING AIDS	100
PREPARE TRAINING LECTURES	91
PREPARE TRAINING TESTS OR EXAMINATIONS	86
DEFINE TRAINING REQUIREMENTS	86
GRADE TRAINING TESTS OR EXAMINATIONS	82
INSTRUCT OR TRAIN PERSONNEL IN PROGRAMMING TECHNIQUES	77
ADMINISTER TRAINING TESTS OR EXAMINATIONS	77
PLAN OR SCHEDULE TRAINING PROGRAMS	68
PREPARE LESSON PLANS FOR MILITARY TRAINING	68
EVALUATE TRAINING METHODS, TECHNIQUES, OR PROGRAMS	68
PUNCH CARDS	68
DEBUG COMPUTER PROGRAMS	64
LOAD PROGRAMS OR DATA FROM CARDS	59
REVIEW TRAINING MATERIALS, SUCH AS INSTRUCTOR GUIDES OR PLANS	55
PREPARE OR UPDATE INDIVIDUAL TRAINING RECORDS	55
COMPILE OR ASSEMBLE PROGRAMS	55
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	55
INITIATE BATCHED JOB PROCESSING	55
STAND WATCH DUTY OR EXTRA DETAILS, SUCH AS PHONE WATCH, DUTY NCO, OR ASSISTANT DUTY NCO	55
PARTICIPATE IN CLASSROOM INSTRUCTION AS A STUDENT	50
INSTRUCT OR TRAIN PERSONNEL TO OPERATE PERIPHERAL EQUIPMENT	50
TRAIN CUSTOMERS ON PROCEDURES, SUCH AS TERMINAL OPERATIONS OR USE OF RETRIEVAL LANGUAGES	50
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	50
CODE COMPUTER PROGRAMS IN HIGHER LEVEL LANGUAGES	50
INSTRUCT OR TRAIN PERSONNEL IN CPU OPERATIONS	45
WRITE OR UPDATE TRAINING MATERIAL, SUCH AS CURRICULUMS, INSTRUCTOR GUIDES, OR PLANS	45

REPRESENTATIVE TASKS
III. DATA BASE ADMINISTRATORS
(INDEPENDENT JOB TYPE)
(GRP218)

TASKS	PERCENT MEMBERS PERFORMING
STORE OR SAFEGUARD CLASSIFIED MATERIAL	100
INPUT, UPDATE, OR RETRIEVE DATA USING REMOTE INQUIRY UNITS, SUCH AS CATHODE-RAY TUBES (CRT) OR TELETYPES	87
TEST COMPUTER PROGRAMS	87
STAMP SECURITY CLASSIFICATION ON MATERIALS	80
PUNCH CARDS	73
DESIGNATE CLASSIFIED MATERIAL FOR DESTRUCTION	73
CODE JOB CONTROL LANGUAGES	73
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	73
DETERMINE SECURITY CLASSIFICATION OF SELF-GENERATED MATERIALS	67
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	67
DESK CHECK PROGRAMS	67
MODIFY OR UPDATE EXISTING COMPUTER PROGRAMS	67
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	60
REVIEW CHANGES TO DATA BASE	60
INTERPRET OR VERIFY CARDS VISUALLY	60
OPTIMIZE JOB CONTROL LANGUAGE (JCL)	53
DESTROY CLASSIFIED OR PRIVACY ACT MATERIAL	53
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	53
COMPILE OR ASSEMBLE PROGRAMS	53
DEBUG COMPUTER PROGRAMS	47
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	47
DETERMINE CAUSES OF PROGRAM HALTS OR ABENDS	40
CHECK IN OR CHECK OUT MAGNETIC MEDIA FROM LIBRARY	40
BATCH RUN REQUESTS	40

REPRESENTATIVE TASKS
IV. SYSTEMS ANALYSTS AND DESIGN PERSONNEL
(INDEPENDENT JOB TYPE)
(GRP264)

TASKS	PERCENT MEMBER PERFORMING
REVIEW PROGRAM SPECIFICATIONS	100
REVIEW PROGRAM REQUIREMENTS	92
DETERMINE SYSTEMS INPUT OR OUTPUT REQUIREMENTS	85
PREPARE OR REVISE PROGRAM SPECIFICATIONS	77
PREPARE SYSTEMS SPECIFICATIONS	77
PREPARE SYSTEM NARRATIVES	77
CONDUCT DESIGN ANALYSIS OR PROJECT TEAM MEETINGS	77
PREPARE OR REVISE PROGRAM OPERATIONS MANUALS	77
CONDUCT SYSTEMS DESIGN STATUS BRIEFINGS	77
PREPARE DOCUMENTATION FOR INDIVIDUAL PROGRAMS	69
PREPARE SYSTEMS USER MANUALS	69
DESIGN DATA ELEMENTS OR CODES	69
PREPARE SYSTEM TEST PLANS	69
PREPARE SYSTEM TEST DATA	69
CONDUCT FINAL SYSTEM REVIEWS FOR USER APPROVAL	69
DEFINE SYSTEMS INTERFACE OR INTEGRATION REQUIREMENTS	69
ESTIMATE PROGRAMMING OR SYSTEM REQUIREMENTS	62
GATHER SYSTEMS ANALYSTS BACKGROUND INFORMATION BY OBSERVATION	62
ANALYZE DATA BASE REQUIREMENTS	62
PREPARE OR REVISE PROGRAM MAINTENANCE MANUALS	62
DESIGN ERROR HANDLING ROUTINES	62
DEBUG COMPUTER PROGRAMS	62
COMPILE OR ASSEMBLE PROGRAMS	62
GATHER SYSTEMS ANALYSIS BACKGROUND INFORMATION BY REVIEW OF SYSTEMS DOCUMENTATION	54
PREPARE PROGRAM TEST SPECIFICATIONS OR INSTRUCTIONS	54
PREPARE OR REVISE COMPUTER OPERATOR INSTRUCTIONS	54
TEST COMPUTER PROGRAMS	54
ANALYZE OR REVIEW SYSTEM TEST RESULTS	54

REPRESENTATIVE TASKS
V. ADP SYSTEMS ACQUISITION PERSONNEL
(INDEPENDENT JOB TYPE)
(GRP216)

TASKS	PERCENT MEMBERS PERFORMING
REVIEW DATA AUTOMATION REQUIREMENTS	92
COORDINATE DATA AUTOMATION REQUIREMENTS	92
REVIEW DATA PROJECT PLANS	83
COORDINATE DATA PROJECT DIRECTIVES	83
COORDINATE DATA PROJECT PLANS	83
REVIEW DATA PROJECT DIRECTIVES	83
PREPARE DATA PROJECT DIRECTIVES	75
DRAFT CORRESPONDENCE, SUCH AS LETTERS, MESSAGES, OR DISPOSITION FORMS	75
PREPARE DATA PROJECT PLANS	67
REVIEW RECOMMENDATIONS FOR NEEDED DATA SYSTEMS EQUIPMENT	67
PREPARE RECOMMENDATIONS FOR CHANGES TO DATA AUTOMATION REQUIREMENTS	58
REVIEW RECOMMENDATIONS FOR SIZE AND CAPACITY OF PROPOSED ADP EQUIPMENT	50
PERFORM ECONOMICAL FEASIBILTY STUDIES	50
MAKE RECOMMENDATIONS FOR ADP EQUIPMENT UPGRADE	42
PREPARE HARDWARE SYSTEM CONVERSION PLANS	42
COORDINATE DEVELOPMENT SPECIFICATIONS	42
PREPARE JUSTIFICATION FOR ACQUISITION OF ADP EQUIPMENT	33
REVIEW REQUESTS FOR DATA PROCESSING SERVICES	33
COMPUTE ADP EQUIPMENT LEASE CHARGES	33
PREPARE PROJECT STATUS REPORTS	33
SPONSOR INCOMING PERSONNEL	33
REPROD CE COPIES OF DOCUMENTS USING OFFICE COPY MACHINE	25
EVALUATE LAYOUT OF FACILITIES	25
GATHER SYSTEMS ANALYSIS BACKGROUND INFORMATION BY REVIEW OF SYSTEMS DOCUMENTATION	25
PLAN FOR EQUIPMENT INSTALLATION	25
REPORT SYSTEM IMPLEMENTATION STATUS OF NEW SYSTEMS TO OTHER AGENCIES	25

REPRESENTATIVE TASKS
VI. COMPUTER SYSTEMS MONITOR
(INDEPENDENT JOB TYPE)
(GRP101)

TASKS	PERCENT MEMBERS PERFORMING
NOTIFY CUSTOMERS OF PRODUCTION PROBLEMS	94
RESPOND TO INQUIRIES FROM CUSTOMERS	94
RESOLVE PRODUCTION PROBLEMS WITH CUSTOMERS	93
NOTIFY CUSTOMERS OF JOB COMPLETION	91
PREPARE JOB OR RUN SHEETS	87
REPORT COMPUTER INPUT DATA CONTENT ERRORS TO CUSTOMERS	83
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	83
PUNCH CARDS	80
COORDINATE WITH OFFICES OF PRIMARY RESPONSIBILITY (OPR) ON NEW OR REVISED REPORTING REQUIREMENTS	76
DISTRIBUTE OR DELIVER OUTPUT PRODUCTS	74
BURST, DECOLLATE, OR ASSEMBLE PRINTED OUTPUT	67
INTERPRET CARDS BY MACHINE	64
EXPLAIN ERROR PRINTOUTS TO CUSTOMERS	62
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	59
NOTIFY PROGRAMMERS OR ANALYSTS OF PROCESSING PROBLEMS	59
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	59
PREPARE UNCLASSIFIED INPUT OR OUTPUT MEDIA FOR MAIL, DELIVERY, OR DISTRIBUTION	58
INTERPRET OR VERIFY CARDS VISUALLY	58
BATCH RUN REQUESTS	58
REPRODUCE CARDS	57
PICK UP FROM OR DELIVER DATA TO COMMUNICATIONS CENTER	56
ESTABLISH OR UPDATE INPUT OR OUTPUT (I/O) LOGS	54
IDENTIFY OR ORDER TAPES NEEDED FROM OFF-SITE STORAGE	52
DETERMINE ALTERNATE METHODS FOR ACCOMPLISHING JOB REQUIREMENTS	51
CHECK IN OR CHECK OUT MAGNETIC MEDIA FROM LIBRARY	50
COMPARE TAPE IDENTIFICATIONS AND TAPE FILE-CONTROLS FOR AGREEMENT	49

APPENDIX B

TASKS COMMON TO BOTH 511X0 AND 511X1 SPECIALTIES

TABLE A

TASKS COMMON TO 511X0 AND 511X1 DAFSC PERSONNEL PERFORMED BY 30 PERCENT OR MORE OF THE SURVEY SAMPLE (PERCENT MEMBERS RESPONDING)

TASKS	DAFSC 511X0 (N=2228)	DAFSC 511X1 (N=914)
NOTIFY SUPERVISORS OR MANAGEMENT OF MACHINE FAILURE, DOWNTIME, OR PROCESSING PROBLEMS	73	31
PUNCH CARDS	71	69
CHANGE OR ALIGN PAPER IN PRINTERS	71	30
REMOVE PRINTED DATA OUTPUT	64	31
LOAD PROGRAMS OR DATA FROM CARDS	60	45
LOAD PROGRAMS OR DATA FROM TAPES	60	45
INITIATE BATCHED JOB PROCESSING	59	48
CONVERT OR RECORD DATA FROM ONE MEDIA TO ANOTHER MEDIA, SUCH AS CARD TO TAPE OR TAPE TO DISK	56	52
ADDRESS OR CALL SYSTEM VIA CONSOLE TO REQUEST INFORMATION	56	36
RESPOND TO INQUIRIES FROM CUSTOMERS	54	45
DETERMINE CAUSE OF FAULTY OUTPUT PRODUCTS	52	45
ENTER DATA OR PROGRAMS INTO COMPUTER VIA CONSOLE	51	44
BATCH RUN REQUESTS	45	31
INTERPRET OR VERIFY CARDS VISUALLY	40	31
LOAD PROGRAMS OR DATA FROM DISKS	38	41
RESOLVE PRODUCTION PROBLEMS WITH CUSTOMERS	37	31
ASSEMBLE, REARRANGE, OR EDIT INPUT OR OUTPUT DATA	34	48
ANALYZE OUTPUT PRODUCTS FOR COMPLIANCE WITH STANDARDS OR SPECIFICATIONS	34	35
PREPARE JOB OR RUN SHEETS	31	42
DETERMINE ALTERNATIVE METHODS FOR ACCOMPLISHING JOB REQUIREMENTS	31	33
PARTICIPATE WITH PROGRAMMERS IN TESTING OR DEBUGGING PROGRAMS	30	51

APPENDIX C

PROPOSED CHANGES TO AFR 39-1

Programming Specialist

*1. SPECIALTY SUMMARY

Prepares computer systems program routines and procedures; tests routines for program verification; provides program documentation and maintenance, conducts systems studies of functional areas to evaluate and develop automated data systems; prepares documentation of proposals and specifications.

*2. DUTIES AND RESPONSIBILITIES

a. Prepares block diagrams, flow charts, and computer coding. Prepares general or expanded block diagrams. Prepares detailed system and program flow charts. Develops document flow charts of systems and general flow charts of systems operations. Desk check codes (suggested addition). Codes from expanded block diagrams into COBOL, FORTRAN, ASSEMBLER language, or higher level language programming.

b. Prepares, tests, and documents computer routines and programs. Determines input/output devices. Prepares input and (suggested addition) output formats and instructions. Prepares system or program test data. Prepare adequate computer edits of input data. (Suggested additions) Initially tests routines and isolates and corrects input products for; programming logic, program logic errors, syntax errors, and keypunching errors (suggested reformatting of paragraph). Arranges test data prior to initial computer processing. Prepares, writes, or updates program documentation. Analyzes output products for compliance with specifications, standards, and interface with existing systems. Debugs computer programs. Utilizes state-of-the-art techniques, such as Top Down Design and Structured Programming. Confers with systems analyst and subject matter personnel in preparation of program routines. Develops and maintains generalized utility routines for application in appropriate overall programs. Reviews existing routines for applicability of new techniques. Assists in developing machine logic charts for machine routines. Establishes and maintains program library of routines and subroutines. (Transfer from para e, performing related programming functions.) Review changes to the data base (suggested additions to include date base managers function).

c. Schedules and controls computer input/output. Insures that input data is complete prior to scheduling programs for computer runs. Establishes and updates program handling to the automated grid or other production control system. Insures output production is timely, accurate, and comforms to the established procedures. Interacts with customers on production problems, inquires, or job completion. Coordinates with OPR on new or revised reporting formats (suggested additions to further specific computer systems monitor responsibilities).

d. Analyzes and updates existing programs. Analyzes existing programs to determine that accuracy is being maintained and the use of techniques, routines, and ADPE are being applied to maximum advantage. Develops new and improved processing procedures and techniques and applies them to existing programs.

e. Operate data communications equipment as appropriate.

Maintain familiarity with and utilizes, whenever practicable, internal and remote inquiry techniques to input, update, or retrieve data. Punch and reproduce cards. Enter data or programs into computer via console and load programs or data from disks, cards, or tapes. Initiate batched job processing, and convert or record data from one media to another. (Additional paragraph to indicate the operations-related responsibilities most commonly performed by programmers.)

f. Organizes and plans work of programming personnel. Conducts or participates in staff meetings. Develops or maintains status boards, graphs, or charts. Conducts on-the-job training for programming personnel.

Programming Technician

*1. SPECIALTY SUMMARY

Develops complete computer programs including all steps of interpretation of general specifications, coding, setting up printing formats, testing, and program maintenance and modification; analyzes and designs automated systems; monitors functional data systems; and supervises programming activities.

*2. DUTIES AND RESPONSIBILITIES

a. Plans computer programs and programming procedures. Designs computer systems and programs to meet the requirements of management. From specific problem definitions, develops and plans computer routines necessary to achieve efficient and effective operating programs. Provides management with guidance and advice in the development of data automation requirements.

b. Prepares block diagrams, flow charts, and computer coding. Prepares general or expanded block diagrams. Prepares detailed system and program flow charts. Develops document flow charts of systems and general flow charts of systems operations. Desk check codes. Codes from expanded block diagrams into COBOL, FORTRAN, ASSEMBLER language, or higher level language programming.

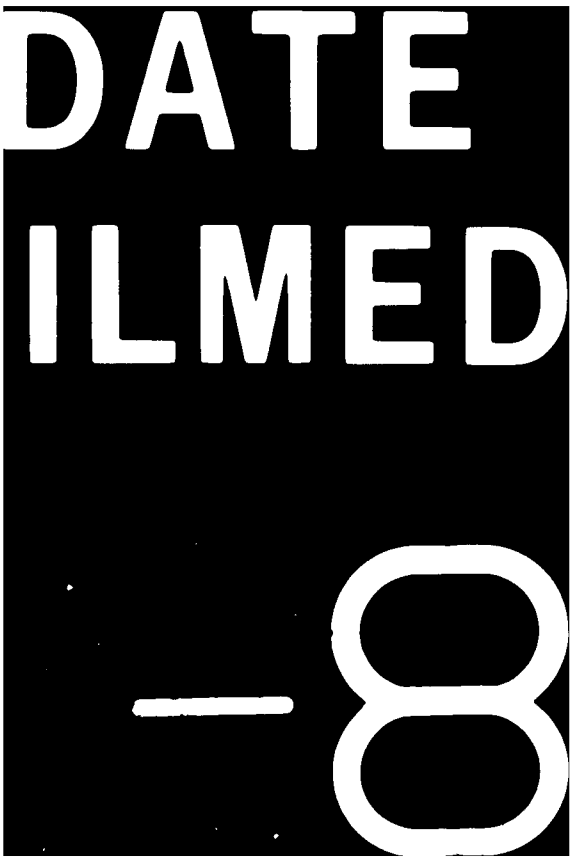
c. Prepares, tests, and documents computer routines and programs. Determines input/output devices. Prepares input and ouput formats and instructions. Prepares system or program test data. Prepares adequate

computer edits of input data. Initially tests routines and isolates and corrects output products for; programming logic, program logic errors, syntax errors, and keypunching errors. Arranges test data prior systems. Determines and recommends most reasonable approach in design of new systems or modification of existing systems. Prepares general systems flow charts, standard language statements, data pertinent to workloads, and present and proposed costs. Determines required data processing equipment, manpower/personnel factors, physical/facilities requirement, and participates in economic analysis to determine costs benefits.

g. Supervises programming and systems analysis and design activities. Plans and organizes work of programming personnel. Conducts or participates in staff meetings. Develops or maintains status reports, graphs, or charts. Conducts on-the-job training for programming personnel. Counsels personnel on personal or military-related problems. Interprets policies, directives, and procedures for subordinates. Evaluates programs or systems development.

h. Operate data communications equipment as appropriate.

Maintain familiarity with and utilizes, whenever practicable, internal and remote inquiry techniques to input, update, and retrieve data. Enter data or programs into computer via console and load programs or data from disks, cards, or tapes. Initiate batched job processing, and convert or record data from one media to another. (Additional paragraph to indicate the operations-related responsibilities most commonly performed by programmers.)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